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Standard Side Effects

On the accidental architectures of fire-safety legislation

Dissertation

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0.1 Contents

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0.2 Abstract
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This dissertation reflects on building standardisation as a mode of design. Eschewing the architect's conventional disdain for regulation - as an external constraint on creative freedom - the ambition here is to ask; by way of their standardisation, how do buildings exert a shaping effect on government? The research presented has been framed through a focus on fire-safety standards and is presented through a series of city case-studies.

Each city study has an historical dimension. They begin by reviewing historical accounts of specific fires, identifying the governmental response that those fires prompted. That is, standards are presented here as historically and geographically specific instruments. Read together these studies offer insight into the plurality of means through which regulators and building designers have responded to the common concern of fire.

The city studies each include an element of by-design analysis, studying the marks that fire-safety standards make on the built environment, and the way they interact with other shaping factors in building design. The ambition here is to explore the unintended consequences of regulation, and the way they come to be 'captured', redirected to novel ends. That process of capture is taken to be politically ambivalent; the effects and side-effects of standardisation are shown to be highly contingent, shaped by the interests of those actors that work closely with them.

Finally, each city study has a theoretical dimension. Fire-safety standardisation is used here as a means to broker dialogue between two related discourses, Governmentality Studies and Infrastructure Studies. Key terms and concepts are drawn from those fields as a means to reflect on the challenges and opportunities provided by the built environment as an instrument of technologically mediated government.

Accident plays an important role in this reflection: programmes of standardisation are shown to respond to accidents, often those that occur in or around buildings; the design process is seen to have an accidental character, shaped by the aggregate of decisions made by different people, in different places, at different times, and with different interests; and buildings themselves are seen to be comprised of accidental qualities, properties that appear essential to some stakeholders, not to others. All these forms of accident shape the thesis findings; drawing on the work of Susan Leigh Star, standardisation is here construed as the construction of a 'Boundary Object', a means to navigate, through material things, the overlapping concerns of diverse actors, so as to facilitate their 'collaboration without consent'. The critical potential of this framing is to highlight the way building reveals fault-lines and powers of consolidation within particular ways of thinking.

The concluding chapter reflects on the role that fire has played in shaping our govern-mentalities. It borrows a term from sociologists John Law and Anne-Marie Mol to describe the 'fire-space' of standards; it suggests that governmental ambitions, laws, and building designs interact, spread, and change in a fire-like way. Through a post-script, it uses this metaphor to engage with the ongoing Grenfell Tower Inquiry, and the way this threatens to shape future governmental, legal and physical architectures in the UK. That conditions of political possibility are shaped by buildings, fires, and fire-safety standards is brought into sharp relief by this particular case.

0.3 Acknowledgements

This PhD has been shaped by many contingent influences. The work presented here has been developed through regular publications, inflected by the thematic focus of a number of journals and books, and the input of their editors and reviewers. My thanks to Adam Sharr at *ARQ*, to Brendan Cormier at *Volume;* to Katie Lloyd Thomas for *Industries of Architecture*; to Adam Jasper and the anonymous reviewers at *Architectural Theory Review*; and to Stephan Redecker at *ARCH+*.

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0.4 Bibliography

Note on Referencing:

Citations in this dissertation have been provided following the Chicago Manual of Style 17th edition 'full-note' convention, and are included within endnotes to chapters. The bibliography below follows the same style guide, and has been organised into sections for printed matter, online material, and personal correspondence.

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0.5 Illustrations

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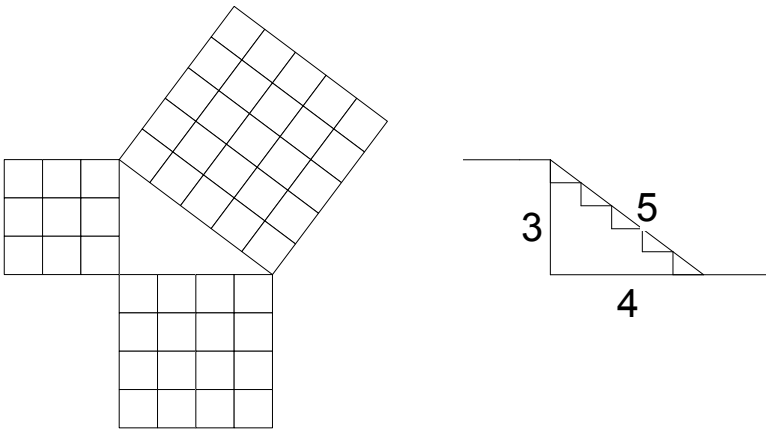
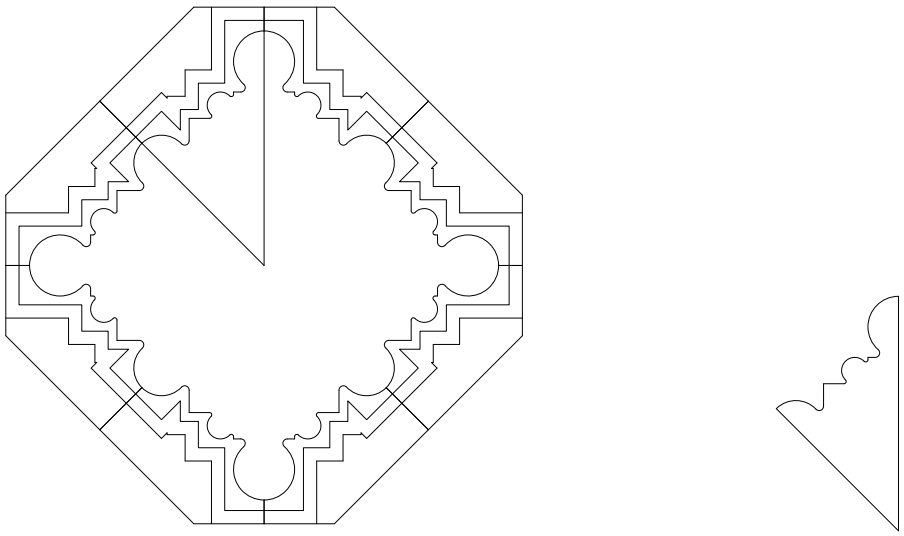
1.2
Preamble
The Architect Regulator



The role of the architect can sometimes seem very close to that of a regulator. In Book 1 of *De architectura,* for instance, Vitruvius tells the apprentice that "Law should be an object of his study".[1] Architects should be familiar with the rules of party-wall construction and rainwater drainage, window lights and building contracts, cesspools and sewage. Alongside such earthly codes, they should also be aware of the "laws of the celestial bodies, the equinoxes, solstices, and courses of the stars"[2] the understanding of which is necessary for the construction of clocks. And these rules are not presented as simple technical requirements; rather, a concept of 'regulation' appears central to his understanding of the discipline and its efficacy.[3] His Ten Books offer a detailed list of 'prescriptions' and 'ordinations', intended to govern building practice, and so 'temper' the effect of the built environment. They tells us, for instance, that "[t]he height of all oblong rooms is thus regulated: add their length and breadth together, of which take one half, and it will give the dimension of the height"; or that "[t]he length and breadth of courts are regulated thus: when a square being described whose side is equal to the width, a diagonal line is drawn therein, the length of which is to be equal to the length of the atrium"; similarly, the "inclined line which regulates the blocks of which steps are formed" should conform to Pythagorean triples (fig. 1.1), except in theatres, where the geometry of stairs should be "regulated by musical proportions and mathematical rules", such that the voice of the actor might "fall on the ears of the audience in a clear and agreeable manner"; every bathhouse must be fitted with "a brazen shield suspended by chains, capable of being so lowered and raised as to regulate the temperature"; just as venters should be used in aqueducts and water-dial's so that the "violence of the air may escape and thus, by these rules, excellently regulate the compression of air".[4]

That is, for Vitruvius architecture itself appears to be a means of regulating;[5] a means of acting in accordance with rules so as to govern over a diverse range of practical concerns including visual affects, physical and thermal comfort, acoustic phenomena, environmental control, the regular distribution of water, and hence even

fig. 1.2
Stone Cutting Templates
Liam Ross, after p. 64, *Carnet,*
Villard de Honnecort (c. 1225.)



the accurate measurement of time. And while 'to the uninformed', his ordinations might make for a motley science, he argues that, to the initiated, they describe an 'harmonious whole'. By suggesting a higher order to be found within such technical concerns, he offers Augustus a discipline that seems to ground the exercise of authority within the practicalities of government.

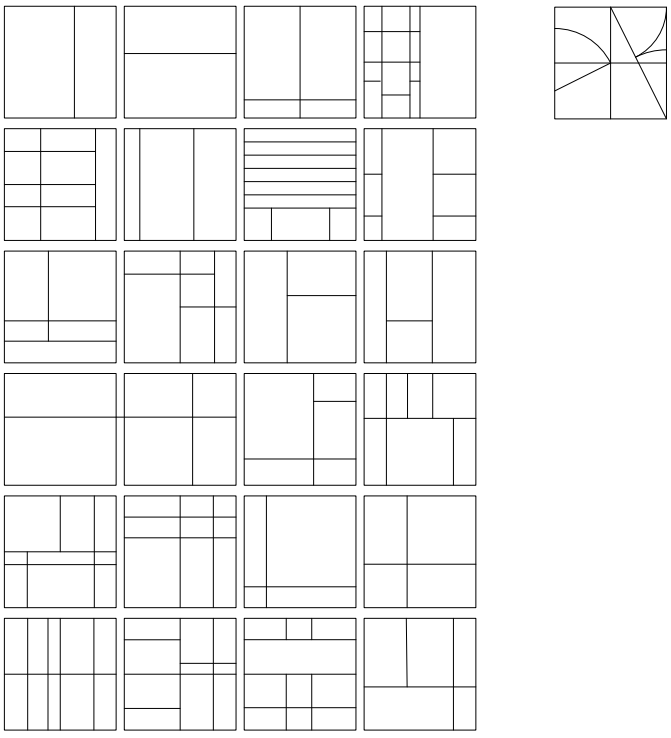
Heroic standards

This close congruence between architecture and regulation is common to many of the most celebrated moments in architectural history, those moments in which the discipline seeks to engage with and shape broader practices. The medieval cathedral, and its importance for metric standardization, would offer another example. Cathedral building campaigns were laboratories of social organization and construction knowledge as well as religiosity. Built prior to the existence of common units of measurement, without recourse to published architectural or structural treatise, and initially without measured plans, their masons had to develop other means of recording and transmitting architectural knowledge.[6] As David Turnbull has argued, one of those means was the 'standard'; fixed metal or flexible string rulers, posted at the gates of cathedral towns, allowing peripatetic builders to calibrate their tools. Used in tandem with cutting templates (fig. 1.2), such standards coordinated the improvisation of individual masons. Brought together through principles of projective geometry and proportion, their ad-hoc collective labour could be made to resemble - in the eyes of the masons and congregation alike - an 'harmonious whole'.

During the period of industrial modernisation, architectural innovation also tracked attempts to standardise construction products. Corbusier's 'Modulor Man', for instance, was developed in response to the French National Organisation for Standardisation's (AFNOR) drive to develop a new metric standard for manufacturing. It attempted to yoke the universalizing potential of mass production to a renewed humanism, echoing Vitruvius in its attempt to discern the Golden Ratio and Fibonacci sequence within anthropometric data. In *Le Modulor* Cobusier proposed a common code that could be used to integrate panel-sizes (fig. 1.3) and structural thicknesses with furniture dimensions and space standards.[7] Endorsed by neither AFNOR nor industry, the system's application remained limited to his own projects, most notably the series of *Unité d'habitations*. These projects read, therefore, as an attempt to reverse-engineer a system of standardisation, complying with the rules *avant la lettre*.

Today software is brokering a further integration of governmental legislation and industrial standardization, building design and construction practices. Building Information Modelling (BIM) has aligned product specification with practices of computer-aided-design (CAD). Ambitions to include regional legislative requirements within such packages – referred to as 'compliance-specification' –

fig. 1.3
"Modular Panel Subdivisions"
Liam Ross, after fig. 39, p. 93, *Le Modulor,* le Corbusier (1954)

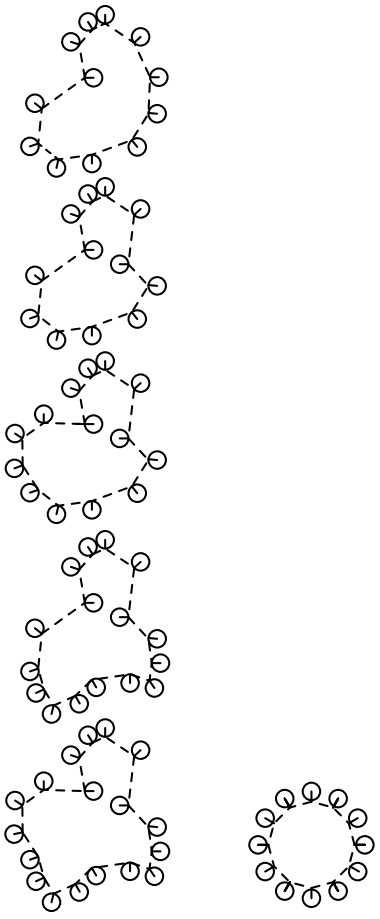


are being pursued in the UK by the National Building Specification (NBS) group.[8] In parallel, developments in rapid prototyping and computer-aided manufacture (CAM) close the gap between conception and fabrication. The next generation of BIM compliant CAD-CAM software promises to encode and enforce the varied requirements of product specification, industrial standards, fabrication processes and legal requirements within an integrated set of architectural prescriptions. Given the disciplinary opportunity (and perhaps threat) posed by such developments, it is not surprising that contemporary architectural theory is pre-occupied with computation, and in particular with the promise (or critique) of 'parametric design'. The proponents of this mode of design practice would return architectural design to the question of the generative code (fig. 1.4). That is, while introducing new technologies and formalities of codification, they nonetheless re-assert the notion of the architect as a rule-maker. "[D]eformation" we are told "no longer spells the breakdown of order, but the lawful inscription of information [allowing] orientation in complex, lawfully differentiated field[s]".[9] Indeed, as ever, the 'manifesto' of this style is to develop a totalizing set of rules, rules that "pursue the parametric design paradigm all the way, penetrating into all corners of the discipline. Systematic adaptive variation, continuous differentiation and dynamic, parametric figuration concern *all* design tasks from urbanism to the level of tectonic detail, interior furnishings and the world of products."[10]

Decentred agency

But to say that rule-making is central to the theory and practice of architecture is only to underscore etymology. *Archē* is the first principle, the rule; the architect is rule personified, the 'commander, chief, or captain' that governs construction; architecture is the physical expression of rule, of the government of building.[11] Nonetheless, these heroic moments of close relationship between architecture and law, standards, or codes can seem to contrast with the everyday experience of contemporary practitioners. Indeed, today it is a commonplace that architects find regulation and standards a constraint on their creativity. In *Architectural Design and Regulation* Rob Imrie and Emma Street conducted interviews with practicing architects in order to gauge their attitude to planning requirements and building standards.[12] The prevailing view saw regulation as a barrier to innovation, leading to mundane and repetitive designs, associated with technical inertia and bureaucratic management rather than progressive government, scientific rationality, or the music of the spheres. While some participants criticized the cliché of feeling "tied up in red-tape", a majority of UK practitioners agreed that "Architecture is subject to too much regulation", and that "Architecture is too bound up in red tape and prescriptive standards"; there was strong agreement with the sense that "Regulation is becoming more complex", and that "Regulation is becoming more difficult to deal with"; likewise, architects felt disengaged, agreeing with the statement "I am rarely consulted by government about planning control and building regulations".[13]

fig. 1.4
Embryological House
Liam Ross, after drawing *Embryological House*, Greg Lynn (2000), collection of the Canadian Centre for Architecture



The reason for this contrast is not difficult to discern: regulations, standards and codes are powerful tools for those who design them, but in contemporary professional practice that is rarely the architect. Vitruvius, the Masons, Corbusier and Schumacher form part of a tradition through which architecture has attempted to define itself through *self-regulation*. Indeed, the 'autonomy' and 'freedom' of artistic practices might well be conceived, paradoxically, through *adherence* to such self-imposed rules.[14] But architecture, perhaps more than other artistic disciplines, is a 'compromised art'; subject to a widespread and complex apparatus of *other-regulation* that impose external constraints on design practice. Today these include, to name but a few: acts of parliament and the mandatory standards they enforce; codes of conduct required by professional bodies; bi-lateral agreements under contract law; the industrial standards and technical guidelines that underwrite warranties and assurances; as well as voluntary modes of performance certification promoted by the marketplace. Like the varied prescriptions of *De architectura*, these ordinances bear upon a diverse range of governmental concerns: the need to safeguard the health and safety of construction workers and populations; the legitimation of functional monopolies through professional accountability; the maximization of industrial efficiency through cross-platform compatibility; or a desire to limit the environmental cost of buildings and their operation. However, unlike the classical architectural treatise, these rules are not written by architects, do not pretend to describe an 'harmonious whole', or to offer building a underlying *arché*. Instead, they are distributed across diverse platforms, authored by a wide range of actors and stakeholders, and express competing, sometimes-contradictory ambitions. Rather than reinforce the authority of the architect, this regulatory apparatus can appear – as Imrie and Street put it - to result in "a dissolution of professional identities and a dispersal of functions to contractors and others not traditionally part of the design and construction process. There is ambivalence about professional identity and role ascription, so that it is no longer easy to identify who does what, or who, precisely, is the architect."[15]

Usurp, subvert, invent, comply

This ambivalence is evident, I think, in recent academic literatures. Over the past decade there have been a number of edited journal volumes dedicated to the fraught relationship between architectural design and legislation: *Perspecta* 35 'Building Codes', suggested that while architecture today is bounded, shaped, and directed by codes and standards, these are seldom the focus of critical or creative inquiry;[16] *Hunch* no. 12 "Bureaucracy" studied governmental regulation and organizational models as a means to understand the contingent character of architectural production, its dependence on client satisfaction, governmental approval, funding and political support;[17] *Architectural Research Quarterly* 16 "Further Reading Required" considered the overlooked disciplinary consequences of the written specification in product literatures and governmental regulation;[18] in *Volume* 38 "The Shape of Law" a wide range of architects and academic were asked "how to deal with the law?", and

fig. 1.5
***Major's House*, Luigi Snozzi (1984)**
Photo Credit: Kalle Soderman.
Source: https://img.kalleswork.net

The Snozzi 7

Any intervention must come to terms with the structure of the place.

Three local structure experts must be nominated for a commission that will examine all projects.

There is no rule defining the architectural language.

Elimination of all distances from roads and between neighbors.

Maximum height for any building is three stories. Extra height can be granted for roof terraces.

The Floor Area Ratio was raised from 0.3 to 1.

Walls 2.5 meters high must be built along the road.

(unwritten eighth rule) Any rule can be broken!

their responses document diverse strategies of fighting, avoiding, subverting or re-defining architecture's legal frameworks;[19] *Architectural Theory Review* 20/2 "Corruption" gathered together stories of legislation, planning, tax rules, price cartels and safety restrictions all understood as stimuli for creative subversion;[20] and, most recently, *ARCH+* 50 "Legislating Architecture" organized itself around the concept that law creates design while itself being subject to design principles, enthusing architects to engage with law as a mode of practice. [21]

Together these publications offer a rich survey of the diverse ways in which contemporary architects have tried to work with, through, around and sometimes against the legislative frameworks of professional practice. For instance, the architect's ambition to *usurp* the authority of law is exemplified by the "The Snozzi 7".[22] In 1968

Luigi Snozzi, as part of a masterplan for the Swiss town of Monte Carasso, proposed a set of seven local by-laws to replace the existing two-hundred-and-forty clause building code (fig. 1.5). His new codes varied in intent and specificity; while Clause 6 required a boundary wall of precisely 2.5 metres to all properties, Clause 1 simply stated that "any intervention must come to terms with the structure of the place". The ambiguity of Clause 1 was answered by Clause 2, which required three 'local structure' experts adjudicate over project compliance. However, as it transpired, the only suitable expert to be identified was Snozzi himself. Indeed, Snozzi notes in conversation that there was also always an unwritten 8th clause, the rule that all other rules could be broken, in exceptional circumstances. His attempt to establish a simple set of codes that would support urban and architectural legibility degenerated into a simple assertion of sovereignty.[23]

Spain's 'guerrilla architect' Santiago Cirugeda, on the other hand, exemplifies an ambition to *subvert* the authority of law. Cirugeda's practice is motivated by a critique of the way in which professional practice, in concert with governmental legislation, frustrates the capacity of individual citizens to improve their own environment. His website *Recetas Urbanas* (Urban Prescriptions) provides an open-source repository of existing regulatory requirements that can be re-directed to novel ends.[24] In "Urban Reserves" he describes the potential to create temporary additions to dwellings through permitting procedures intended to facilitate scaffolding. "Public Domain Occupation with Skips" lists a number of things you can do in a dumpster, in order to suggest urban interventions – a playground, a room – that can occupy the legislative space of skip permits.

The work of Arno Brandlhuber and collaborators offers its own array of approaches to legislation, sometimes earnestly inventing new agreements, or complying with ironic enthusiasm to existing ones.[25] The "2.56" building in Cologne (1996-7) is an apartment and office that occupies a 2.56 metre wide gap-site. In order to maximize interior width, the building contravenes German building codes that

fig. 1.6
"Building Yourself and Urban Reserve"
Santiago Cirugeda (1998). Photographer unknown. Source: IMG.01/03 http://www.recetasurbanas.net

Apply in your local Urban Planning office (or similar) to the license of a minor alteration to paint the facade of the building to which you want to fix yourself....

Ask a friend or relation, who should be an architect (there are plenty), to sign the scaffolding project, together with the preliminary health and safety plan. When it comes to talk about wages, a few beers will do.

With the paid minor alteration license (some 3000 pts / 18€) and the local authorities permit for the project (some 4000 pts. / 24€), we can actually apply to the license for placing the scaffold, because, although it is true you must define how long will the works take, you can obtain it without a tick in the appropriate box and so make it last indefinitely (experience backs me up)...

Design your own urban reserve using your favorite materials and styles.

Once you have the license (approx. One month after) install the scaffolding together with the reserve.

require every building to be self-supporting. Brokering an owner's obligation to cover the cost of compartment wall retention in the event of demolition, the project created a legal framework through which it could bear upon the neighbouring buildings, and so set a legal precedent in Germany. The form of "Krystal", Copenhagen (2003-6) is a direct expression of the clearance and setback ordinances attached to its four bordering firewalls, consciously echoing the illustrations of Hugh Ferris.[26] "Rachel", in Kampnitz (2012), circumvents a planning requirement that permits modernization of an existing structure on the proviso that the original building remains standing at all times during construction. Inspired by and named after Rachel Whiteread, the 'modernisation' used the existing structure as formwork for a new poured-concrete building. The resulting structure, though diverging in form and function from the original, nonetheless testifies to the fact that, during the construction process itself, the original walls remained standing.

Rival utopias

Diverse as these approaches may be, they nonetheless suggest a commonly acknowledged problematic, already outlined by Imrie and Street: a need to assert the agency of architecture in the face of its apparent dissolution through the imposition of externally defined regulatory requirements. The above projects seem to share an ambition – expressed either through direct appropriation, subversive wit, competitive invention, or ironic compliance – to demarcate architecture from the normative frameworks of contemporary building design, to assert the discipline as a sovereign space in which law is conceived, transgressed, interpreted or written. That is, if architecture is to retain the *arché* of building, it seems to finds a rival in law. We can perhaps see why; Architecture and law share some disciplinary traits, both being forms of knowledge that draw upon diverse practical concerns, orienting them toward a deontic and utopian end.[27] Both are sciences of how things *ought* to be, as opposed to the way they are; both are based upon an always-already assumed invitation to intervene, to condition, to clean up messy reality with neat solutions.[28]

But as we have seen, the two disciplines are also different: where architecture seems dependent upon an *archē,* a singular authority through which to construct harmonic wholes, the prescriptions and ordinations of our building regulations do not seem troubled by this representational ambition; they suggest no totality, no personified expression of authority.[29] Perhaps this is why contemporary architectural practice seems so troubled by its regulatory frameworks: they unsettle the discipline's basic assumptions, displacing authorship without seeking to replace it, creating rules that do not want for artistic expression, listing contingencies that suggest no totality. That is, within the varied attempts of architects to 'deal' with law – through ironic compliance or apathetic frustration – I think we can see something of a disciplinary *méconnaissance*, a romantic-comedy of mis-recognition. Presented with an incongruent patchwork of ad-

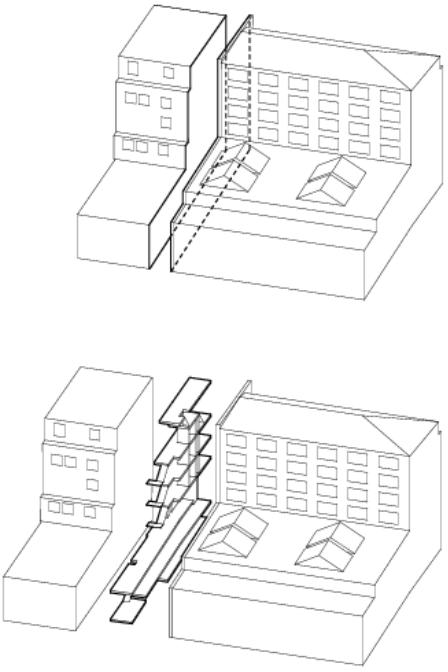


fig. 1.7
***Rachel*, Brandlehuber + (2012).**
Photo credit Erica Overmeer.
Source: https://www.brandlhuber.com

hoc and practical requirements, the architect is pre-disposed to find a 'first principle' upon (or against) which to ground their practice. The competing demands of this professional artist only seem to be satisfied when externally imposed rules are fully internalised.

Infrastructural unconscious

It would be easy to get caught up in this oppositional thinking, to construe the question of architecture and regulation as one of simple hubris. But my purpose in sketching these perceived disciplinary tensions is rather to set them aside, to look this topic from a different perspective. Snozzi, Cirugeda and Brandlhuber's works is exemplary because it is self-consciously *not* the 'norm'; it foregrounds problems and potentials normally taken for granted. But the subject of this dissertation is, rather, our 'normal' way of working with norms, our 'standard' approach to standards. The interaction of design intent and legal requirement is – in the experience of this author – much more muddy, mundane, and ambivalent than any of these heroic or ironic commentaries suggest: It is the patient, tedious labour of achieving compliance with requirements that remain unthematised by a design concept, or the expedience that necessity brings to a design options appraisal; the slight-of-hand that obfuscates an unflattering requirement, or the serendipity of a rule that reinforces the designer's intent'; the work-around that brings an already-designed building into concord with an overlooked rule, or the necessity that gives rise to invention. That is, in everyday practice, our tussle with norms, codes and standards cannot be simply characterized as either restrictive or liberating, and their requirements are rarely in the forefront of our minds; they are engaged with subliminally, in passing, only rising to significance when they support or frustrate some other concern. Indeed, we could say that regulations, standards and codes are the 'infrastructural unconsicous' of professional practice;[30] they define those wheels that don't need reinvention, the decisions already taken, the options best left unexplored, the best practices assumed. They form a naturalised 'ground' that shapes design practice while remaining transparent to it, having become familiar through use.

Naturalised, but nonetheless constructed. Self-consciously or otherwise, the architect works hard to *build* this infrastructure, to concretise its legal abstractions, to resolve its conflicts, to smooth off its edges, to bring messy reality in line. Constructing the invisibility of law: this is the everyday work of the architect, whether it is recognised or not. That is, the work of regulating architecture is not normally a celebration or a critique, but a sublimation. Through the architects work, the prescriptions and ordinations of buildings codes and standards are built into the woodwork of our buildings and cities, such that they come to conduct our conduct without asking us to think, without 'subjectification'. In this way, architecture contributes to what Andreas Philippopoulos-Mihalopoulous has called the "lawscape'. There is, he suggests, a kind of 'incestuous intimacy' between law and the built environment, a mutually sup-

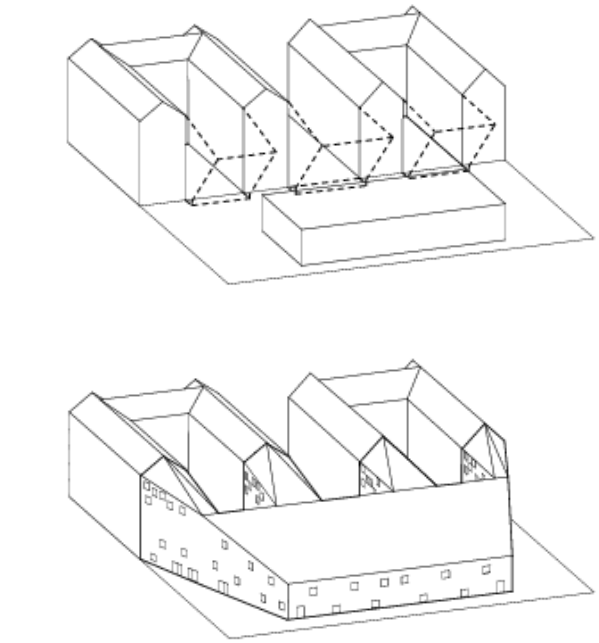


fig. 1.8
***Krystal*, Brandlehuber + (2003).**
Photo credit Erica Overmeer:
Source: https://www.brandlhuber.com

portive interaction between two normativities, between that which is permissible under law and that which is habitual and familiar in the environment. As he puts it, while "law is the city's measure, the (in)flexible, (un)reliable metallic ruler that makes its presence felt through inches and centimetres of propinquity and distance, determining identity and difference."[31] In turn, the city is law's 'megaphone':

> [I]n the city law's presence is magnified to a deafening extent - so much so that one no longer feels its presence: planning restrictions, environmental regulations, zoning, social control, borders between private, public, and restricted access areas, pavements, roads, traffic lights, metro barriers, flows of people, headscarves at school, hoods in shopping malls, power architecture and landscaping, are a few of the urban legal moments.[32]

Accidental architectures

The subject matter of this PhD research project, then, is not that of the architects' attitude or approach toward legislation. Its ambition is neither to affirm nor critique any particular form of architectural practice. Rather, its opening hunch – which this preamble has been an attempt to outline - is that architects' attitudes and approaches to legislation are overshadowed by, and a foil for, their own disciplinary problems, their own desire to control, govern, rule. That is, in the work of those architects described above, the author senses that the utopian ambition of architecture – to find and express founding organizational principles – tends to render law, legislation and standardization more monolithic and coherent than they actually are.

What the project *does* take from the professional discourses summarized above is the sense that contemporary architectural practice operates in a context of distributed design agency. It is difficult to find, personify or lend expression to foundational organizing principles in contemporary architecture; our buildings and cities seems increasingly accidental, the product of an encounter between an escalator and an air-conditioning system, between egress codes and access requirements.[33] But this concern is, of course, only a local instance of a broader trend. Today governmental programmes *per se* operate through increasingly distributed means, often technologically embedded, toward ends defined by a wide plurality of actors. That is, the increasing regulation and standardization of building design is just one aspect of a broader process of 'governmentalisation', an increased mutual imbrication between government, and the health, safety, welfare and economic prosperity of its population.

This study, then, is an attempt to reflect on building design in that condition of distributed governance. Processes of building regulation and standardization are its means of reflecting. It considers standards and codes as the 'infrastructure' of design practice, defining

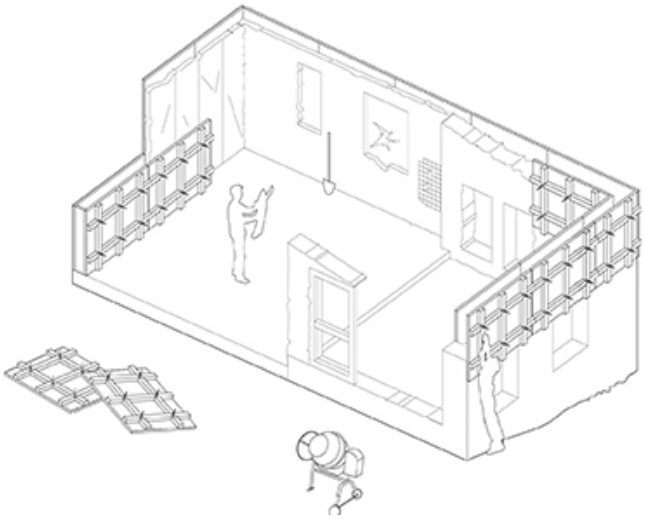


fig. 1.9
***2.56*, Brandlehuber + (1996-7).**
Photo credit Erica Overmeer:
Source: https://www.brandlhuber.com

its unspoken and unthematised norms. It studies the way that those norms shape design practice, by asking some quite ordinary questions. What are the assumptions and rationalities that underpin our regulatory frameworks? How are these rationalities translated into textual or spatial codes? What marks do those codes make on our buildings and cities? How do they interact with, and get redirected by, other shaping forces in building design? And what are the effects of these codes; do they ever differ from their stated intent? By asking these questions it hopes to show that the design of our buildings and cities *shape* government as much as being shaped by it; that the contingencies of our built environment and our rationalities of government are written into each other, being mutually constitutive.

1.2
Summary
Between the Rational and the Material

The preamble above outlined the 'romance' of this research project. It spoke of the things it takes for granted, those that it hopes to find, as well as trajectories not taken. But in doing so it also outlined the principle research question pursued. This dissertation asks, by way of its standardisation, how does building design contribute to the shaping of government? This section provides a summary of the dissertation and its findings. It begins with a concise statement of the thesis, and an outline of the dissertations structure. It goes on to offer a précis of each chapter, highlighting key concepts in advance, noting their importance for the developing argument.

The central contention of the thesis is that building design shapes government by way of its side-effects. Building designs are not presented here as a neutral medium upon which governmental ambitions are projected, but as both the origin of governmental problems, and the medium through which they come to be translated, and transformed. Standardisation is here presented as a means to understand that process of transformation. Drawing on the schema provided by Susan Leigh Star, that process is understood to have three parts. Programmes of government are understood to be prompted when communities gather around shared concerns, problems, or ambitions, described here as 'boundary objects'. Standards are understood as a means through which that community comes to common terms with that shared object. They are seen to succeed when they navigate the interests of the varied stakeholders concerned, and the material characteristics of the problem itself. They fail when they do not accommodate particular ways of thinking or physical properties, and so throw some or all of that community back onto the original problem, or indeed construct new problems. Building standardisation is therefore presented here as a practice through which diverse actors concerned attempt to come to common terms over shared concerns, and the way in which their agreement is shaped by the physical properties of building itself.

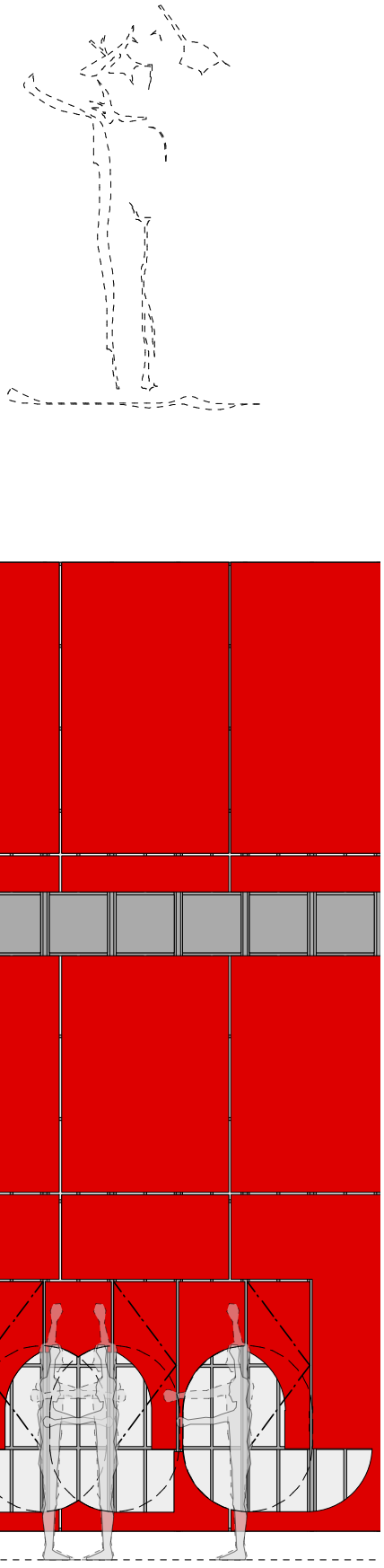


fig. 1.10
Accidental architectures of British Standard 8213
Liam Ross, 2013

Installation proposal for 66 Portland Place, Detail.

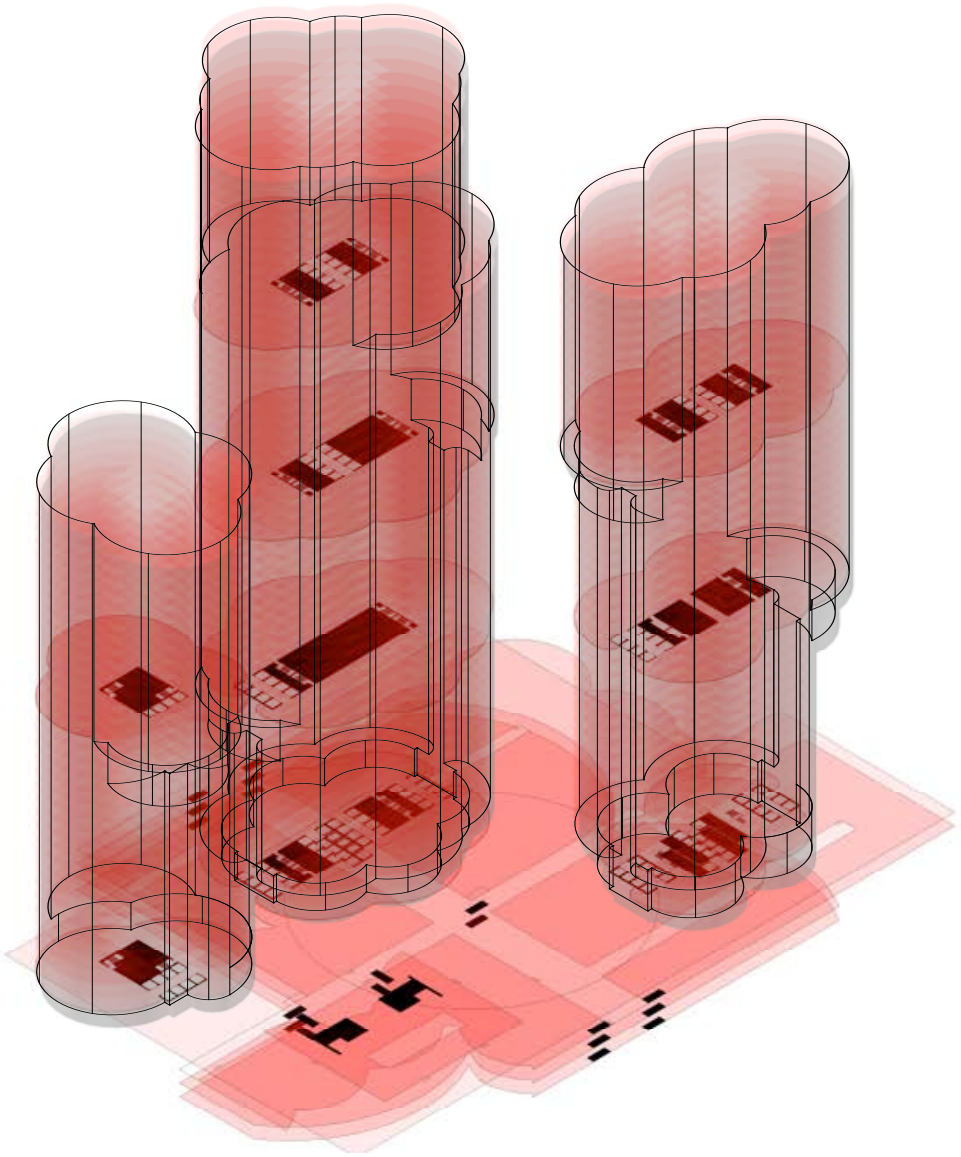
The scope of the dissertation is limited through a focus on one particular governmental problem, that of fire-safety. That common problem is approached, at different historical and geographical moments through four city case studies, considering in turn Edinburgh, Lagos, Tokyo and London. Each of those city studies begins with a specific fire, and its first ambition is to identify the specific governmental response that that fire prompted. To that end, each of the case studies has an historical dimension; their ambition is first to situate particular regulatory frameworks within particular 'governing-mentalities'. The dissertation does not seek to offer novel historical research; here it depends upon and collates existing scholarship, and so depends on secondary sources (in the case of its the Japanese and Nigerian city studies, it likewise depends on translations of such sources). The novel contribution of each chapter, though, is to consider the side-effects of those regulatory frameworks. Through original primary research – working between legal documents, surveys of the built environment, and interviews with diverse actors – they look for discrepancies between the intents and effect of those legal frameworks. In doing so, they seek to suggest how, by being translated into the built environment, govern-mentalities change. Finally, each study also has a theoretical ambition. Drawing on a range of sources, they seek to theorise the particular discrepancies identified. Here the aim of the research is to apply existing theoretical concepts to novel contexts, though in doing so, at times it extends and makes contributions to those concepts. The dissertation is supported by original by-design analysis; diagrammatic studies of legal codes, and surveys of existing built environments. This material is collated within the appendix of this dissertation – in Folios 8-12 – is drawn upon locally within the city studies where relevant to the argument.

Readings on Governmentality and Infrastructure

The first chapter of this dissertation offers an extended reflection on context and methods, presented in three sections. The first of these provides a review of recent literatures on standardization and government, developing a conceptual framework that underpins the later research. Two distinct but related discourses are considered, the first being Anglophone neo-Foucauldian studies of 'governmentality'. Foucault's concept is taken to be of particular relevance to the study, focusing as it does on the decentered modes of authority embedded within everyday practices and technologies. This review focuses on the way the concept of governmentality has been developed by contemporary scholars through research into regulation and standardisation. It draws on Mitchell Dean's *Governmentality: Power and Rule in Modern Society* in characterising the work of these scholars through their focus on the *discursive* character of governmental programmes. Within these literatures, the process of standardization is considered, not as a technical solution to given problems, but as a mode of problematising through which the scope and purpose of government comes to be constituted rationally, epistemologically and technically. A focus on the 'utopian' character of standards – already touched upon in the preamble – is taken from

fig. 1.11
Accidental Architectures of British Standard 9999
Liam Ross, 2015

Permitted travel distances at the Toronto Dominion Centre, Axonometric



Dean, who suggests that the critical purchase offered by Governmentality Studies stems from the optimistic disposition it detects within government *per se* – that is, a tendency to focus on what is *said* as opposed to what is *done*. The key issue taken from the work of these scholars is the need to distinguish between the intent of 'governing rationalities' and the effects of 'governing technologies'.

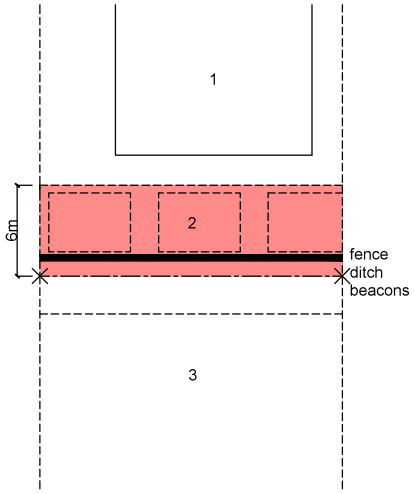
The second set of literatures comes from Science, Technology and Society (STS) studies, specifically from scholars associated with the emerging field of Infrastructure Studies. These literatures are shown to compliment and extend the critical ambitions of neo-Foucauldian scholarship. Their authors - often associated with Actor Network Theory - likewise highlight the difficulty of translating governmental ambitions into effective 'technical delegates'. Their focus on the *material* character of standardization, however, shifts analysis away from the stated intent of governmental programmes, to concentrate on their (often unintended) consequences. It is within this set of literatures that the work of Susan Leigh Star is introduced. Her studies of standardisation provide this dissertation with a set of cues intended to direct its attention away from the discursive frame of governmental standards, focusing instead on what rules do. The methodological frame of this dissertation is defined in this section in relation to Leigh Star's work; it sets out an ambition to study the 'residues' of standardization, its 'textures', 'mess-trajectories' and 'indeterminacy', as well as the 'practical politics' of its application, prompts which the following city studies take up in turn.

The Reach of an Old Woman's Arm

The second section of this opening part presents a preparatory study, completed before the main body of research, which serves as a worked example of the developing methodology. That study explores Edinburgh through a specific regulatory requirement, *British Standard 8213-1: Windows doors and rooflights. Design for safety in use and during cleaning of windows***.** It first situates that regulation historically, offering a brief genealogy of building standards in Scotland, with a specific focus on those concerned with safety. Charting their origins within medieval trade guilds, through Police Acts and concerns over public health, it offers this genealogy as an example of the emergence of 'governmentality' in the Foucauldian sense – an historical period in which the State comes to assume an increasing responsibility for the wellbeing of the population, developing modes of government that operates through dispersed technical means. It goes on, however, to consider the utopian character of this regulation, the divergence between its intents and effects. It considers the way people work with and around the rule, charting the way it creates particular 'residues' within Edinburgh's physical and legal fabric. This analysis is supported by Folio 8, which presents a series of by-design studies that explore the accidental architectures of British Standard 8213 (fig. 1.10).

fig. 1.12
Survey of the Lagos Setback Zone
Photograph Liam Ross

Survey and photograph of non-compliant constructions in at Lagos State Police Barracks



Infrastructure Inversion

The final section of this opening part offers a digression on a particular methodological challenge identified in the above literature review and preparatory research; the challenge of making *visible* aspects of the built environment that are usually taken for granted. Again drawing upon the work of Susan Leigh Star, it outlines her concept of 'Infrastructure Inversion'; of a moment in which the assumptions, rationalities, technologies or identities of building standards are suddenly 'figured', becoming apparent in their strangeness and contingency. Recognising that such moments are often comic, this section reflects on the methodological importance of humor and irony for Leigh Star, and for a number of other authors considered as part of the literature review above.

The Shape of the British National Anthem

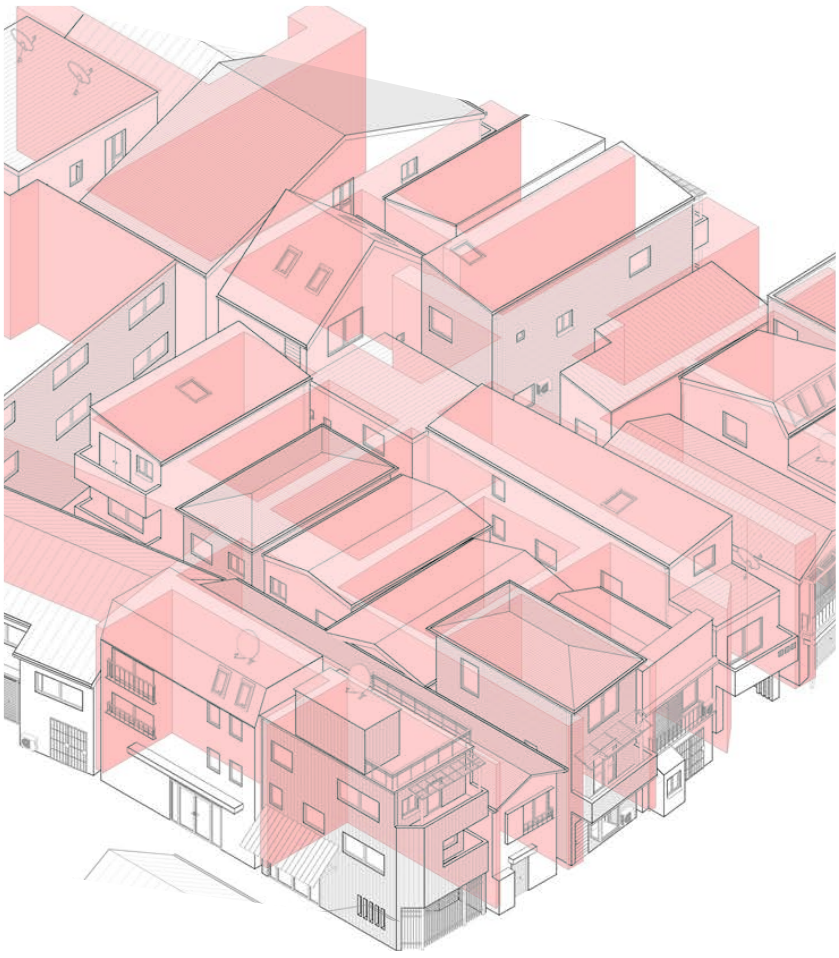
The first fire-safety city study concerns Edinburgh, using this city as a mean to reflect on the relationship between standards and their historic and geographic origins. The first section of this study begins by recounting the 1911 Empire Palace Theatre fire in Edinburgh and its importance in defining egress time as a regulatory concept. It goes on to offer a study of the intents and effects of *BS 9999:2008 Code of practice for fire safety in the design, management and use of buildings*, the contemporary code that defines egress time in the UK, and abroad. This particular rule is then situated in a broader context. The second section charts a series of reflexive exchanges through which Edinburgh's built fabric and its legal frameworks have co-produced each-other, considering the city and its legislature as an archaeology of governmentality. The third section uses those exchanges to engage with and extend the governmental concept of Regulatory Space, defined by Leigh Hancher and Michael Moran in *Capitalism, Culture, and Economic Regulation.* This concept is shown to describe how historically and geographically specific legislative frameworks are, shaped by networks of stakeholders. The theoretical ambition of this chapter, though, is to take Hancher and Moran's metaphor literally, to include the non-human actancies of space, stone, gravity, water, and fire in the shaping of such frameworks. The final section reflects on the particular 'texture' of travel distance codes, the way its effects are shaped by detailed characteristics, known only to those who work closely with it. This section is supported by Folio 9 which presents a series of by-design studies that explore the accidental architectures of travel distance codes (fig. 1.11).

The Flight of a Muzzle Spark

The second city study begins an exploration of the way that governmentalities transform as they travel, considering the importation of British Standards to colonial Nigeria. It begins by recounting the military and political significance of fire during the cession of La-

fig. 1.13
Accidental Urbanism of Earthquake Resilience Ordinance
Yida Zhou, 2017, Student design project, University of Edinburgh, detail. Supervised by Liam Ross

Roji in Ojima



gos, contextualising the first British by-law, imposed in 1863. This law defined a requirement for fire-safety setbacks, a requirement enforced today through *Lagos State Physical Planning Department Regulation 15*. The chapter examines the way in which the purpose of this rule has transformed, both tacitly and explicitly, in the intervening period, adapting to and prompting a range of different political circumstances. Standards are here reflected upon as particular ways of seeing the city, a theme which is supported through recourse to literatures in Law and Geography studies. Engaging with the concept of 'Seeing Like a City', the theoretical ambition of this study is to reflect on the political ambivalence of laws, suggesting that it is through their appropriation that the sovereign violence which underwrites them is gradually 'recycled'. Again, it attempts to extend these discussions by considering the role that materialisation and spatialisation play within such legal appropriations. This section is supported by Folio 3, which presents a survey of the Lagos setback zone, and the ways in which it is currently occupied, formally and informally.

Spectres of Edo Castle

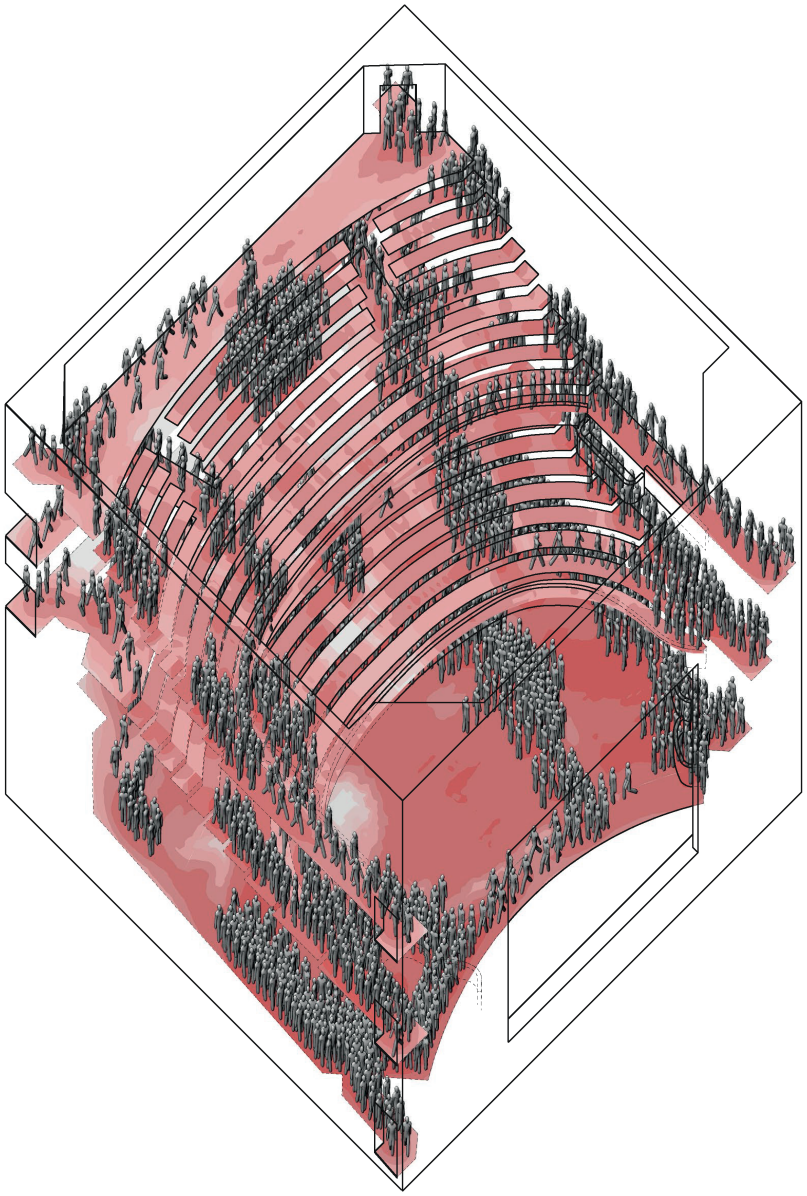
The third city study uses Tokyo as a means through which to engage with literatures on risk. The chapter begins by describing the three catastrophic fires that have shaped Edo-Tokyo: the Great Fire of Meirecki, the Great Canto Earthquake and the Great Tokyo Air Raid. It studies the principal regulatory measures developed in response to those events – land readjustment schemes and fire-safety promotion zones – considered together to be the 'mother of urban design' in Japan. It offers a genealogy of these regulations, considering their dramatic impact on the city's urban fabric, but also noting their failure to prevent successive fires. Ulrich Beck's *Risk Society* analytic is then drawn upon, as a means to reflects on the way that governmental programmes sometimes reflexively sustain the problems they purport to address. Beck's analysis supports a reflection on standards and historical imagination; the study considers the risk that standardisation traps government within the problems of the past. Extending some of Beck's concepts beyond their intended frame, though, it suggests a process of 'Enforced Cosmopolitanism' at work as a by-product of fire-risk, one that is suggestive of new construction technologies, fire-safety approaches and modes of tenure. This section is supported by Folio 11, which offers a by-design analysis of the accidental urbanism of the Tokyo Metropoltan Governments earthquake and fire-resistance ordinances.

Engineering Uncertainty

The final city study turns to the question of deregulating fire-safety, considering the opportunities and problems this poses for the neo-liberal govern-mentality. It begins by recounting the World Trade Centre attack, New York, the subsequent debates over the building's structural collapse, and the surprising effect these have

fig. 1.14
Simulating Sigmund Neuberger
Max Ochel and Liam Ross, 2016

'Experienced Density' rendering, OaSys MassMotion egress simulation, Empire Palace Theatre, Edinburgh.



had on the UK's legislative context. This chapter focuses not on a specific code, but rather on a number of initiatives pioneered by Arup Associates to computationally model the dynamics of fire, smoke and crowd behaviour, and the ways these have been used to circumvent existing legislative frameworks. It situates these initiatives within the emergence of fire-safety science and its ambition to develop 'performance-based' standards. Identifying epistemological and practical difficulties within this ambition, it suggests they be recognized as an attempt to meta-engineer the legislative frameworks of UK professional practice. It reflects on this attempt through Pat O'Malley's notion of 'governing by uncertainty', and Foucault's 'environmentality' of government. Concluding with a close analysis of one of the key instruments of fire-safety engineering – Arup's MassMotion software package – it returns to the problem of egress time, noting how this software black boxes the assumptions of BS9999. The section is supported by Folio 4, which studies the attempts to translate, prescriptively and performatively, legally and computationally, the 1911 Empire Palace Theatre fire into a definition of 'safety'.

Fire Space / Reality Test Grenfell

The dissertation concludes by reflecting on the fact that, during the course of writing, its object of study has shifted. Beginning as a reflection on building standardisation *per se*, but becoming increasingly engaged with the particular problem of fire. Drawing on the work of Gaston Bachelard, John Law and Annemarie Mol, it attempts to describe more fully the actancy of fire within these reflections. Appropriating the concept of *Fire-Space* from Law and Mol it re-articulates the research findings in a new way – as a description of the mutually constitutive relationship between fire, the city, law and government – and attempts to describe that relationship as fire-*like* in shape. By doing so, it suggests that the material presented here be read as part of an ambition to *situate* governmentality, both materially and spatially.

Using this refined terminology, the dissertation ends with a postscript that describes the 'fire-space' being constructed in the wake of the Grenfell Tower fire. It does so through a cross-reading of two documents; an expert witness report that describes the way in which this particular building burned down, and a governmental review that suggests regulatory failing revealed by that fire. It reads the two documents together so as to use the building fire as a means to critique the governmental review. In doing so, it attempts to describe the socio-technical 'objectivity' of events like Grenfell through the resistance they offer to particular programmes of governmentalisation.

Contribution to the Field

The topic of this dissertation, then, is not architecture in terms of its own theorization. In general, the following chapters do not draw upon the work of historic or contemporary architectural theorists as either research material, or as points of reference.[34] Nonetheless, as outlined in the preamble, the dissertation does recognize a recent interest, within popular and academic architectural publications, in the topic of regulation specifically, and that of 'infrastructure' more broadly. That interest forms an important context to which the dissertation hope to contribute. In the Anglo-American field the work of two groups of scholars has, while not directly drawn upon or cited, been of particular relevance to this study, and is important to note.

The work of the Aggregate Architectural History Collaborative, a network of North American scholars, has been informative to this study, both in terms of its subject matter and its tools of analysis. The work of this group – conducted through organized symposia and published through an online platform[35] - intentionally turns away from the high-culture and politics of Architectural Modernism to consider seemingly mundane concerns; the ways in which the built environment is used to establish protocols, rules and structures that regulate the basic aspects of our social lives, so conducting our conduct. In their first published compendium, *Governing by* Design, they present that work as a collective response to the Foucauldian concept of 'Governmentality'.[36] The work of some individual members are of particular interest to the author: Timothy Hyde's studies of architecture and law, Jonathan Massey's study of mortgage contracts, and Micheal Osman's work on the written specification have all inspired the current study, and the work of Arindam Dutta is explicitly cited and engaged within in Chapter 6.

In the UK, the work of Katie Lloyd Thomas, Nick Beech and Tilo Amhof are likewise of particular importance here. Their work – as editors of *Architectural Research Quarterly 16* "Further Reading Required" has already been mentioned above. However, it is perhaps in their organising of the AHRA's 2014 conference *Industries of Architecture* that these scholars had the most direct impact upon the current work. In that conference they sought to draw together scholars working on topics often side-lined by architectural theory, but which nonetheless have a profound shaping effect on conditions of practice. Indeed, their call for papers explicitly asked "[h]ow are 'immaterial' forces such as law and regulation materialised in building and with what effects? How and in what ways does risk management or the requirement for comfort or the performance imperative transform materials, practices and the possibilities of design?", questions to which this dissertation hopes to offer answers. The intellectual context within which they framed this work call cited the work of Aggregate scholars, but likewise drew upon scholars within Science and Technology Studies that are engaged with here. Interest in this topic extends beyond the Anglo-American sphere. The work of Helena Mattsson and Caterina Gabrielsson - exemplified in

their conference *Architecture of Deregulation*,[37] and in Mattsson's own engagement with Foucault and Governmentality[38] – should also be noted as influential to the current study, if not drawn upon directly. The thesis seeks to contribute to this growing body of literature that brings critical theoretical attention to the 'infrastructures' of design practice. The novelty it offers within the architectural field is two-fold. Firstly, within the literatures cited here and in the preamble, there does not exist a sustained engagement with the particular subject matter at hand here; fire-safety is a problem that brings architectural design into close contact with 'governmentality'. As such, the dissertation explores a range of historical and technical concerns not yet explored within these literatures. It likewise brings new conceptual tools to bear upon that subject matter. While the work of some STS scholars – notably Bruno Latour – are widely known, and are coming to influence academic work in the architectural field,[39] the work of Susan Leigh Star, and literatures associated with 'Infrastructure Studies' per se, are not well known. The set of methodological prompts pursued in this dissertation, drawn from Leigh Star's work, and outlined in the following sections, offer a novel set of research questions for the architectural humanities.

(Endnotes)

1 Marcus Vitruvius Pollio and Joseph Gwilt, The Architecture of M. Vitruvius Pollio in Ten Books, Translated from the Latin by J. Gwilt, 1826. p. 7

2 Pollio and Gwilt. p. 7

3 I base this on Bill Thayer's analysis of the text, which draws on the 1826 English translation by Gwilt, and the Latin of Teubner's 1899 edition by Valentin Rose. Comparing the two, 'regulation' appears Gwilt's preferred translation of a range of synonyms including law (lex), prescription (praescriptum), ordinations (ordinatio) and temper (temperatio), creating a textual ambiguity between the way architecture is subject to rules, is itself a form of rule-making, and becomes a means of enforcing rules. See 'LacusCurtius • Vitruvius on Architecture — Book I', accessed 20 July 2017, http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Vitruvius/1*.html.

4 I offer here a sample of the variety of ways Vitruvius, via Gwilt, deploys the concept of regulation. The examples cited are taken, respectively, from Book VI (on rooms and courts), Book IX (on stairs), Book V (on theatres and bathhouses) and Book VIII (on 'venters'). See Pollio and Gwilt, The Architecture of M. Vitruvius Pollio in Ten Books, Translated from the Latin by J. Gwilt. p. 7

5 The terms 'legislation' and 'regulation' distinguish between the act of writing rules, and of governing in accordance with them. I use here the former, suggesting that while Vitruvius collates and disseminates rules of various kinds, his own rules is one of conveying as opposed to defining. Legislation is the act of writing and proposing laws, from 'legis', genitive of 'lex' (law) and 'lator' (proposer). See 'Legislation, N.', OED Online (Oxford University Press), accessed 29 July 2017, http://www.oed.com.ezproxy.is.ed.ac.uk/view/Entry/107097#eid39646647. To regulate, by contrast, is the act of enforcing law, of controlling, modifying, or adjusting something with reference to a principle, standard, or norm. See 'Regulate, V.', OED Online (Oxford University Press), accessed 14 October 2014, http://www.oed.com.ezproxy.is.ed.ac.uk/view/Entry/161422?

6 In this argument, and in discussion of the roll of standards, templates and geometry, I am drawing on David Turnbull, 'The Ad Hoc Collective Work of Building Gothic Cathedrals with Templates, String and Geometry', Science, Technology and Human Values 18, no. 3 (1993): 315–40.

7 Le Corbusier, The Modulor and Modulor 2 (Springer Science & Business Media, 2004).

8 John Gelder, 'Integrated. Dis-Integrated. Coordinated. Re-Integrated', Arq: Architectural Research Quarterly 16, no. 3 (September 2012): 253–60, https://doi.org/10.1017/S1359135513000109.from ancient Greece through to the near future, in terms of the degree to which the contract documentation is integrated. Documentation might comprise anything from a single 'integrated' text to a range of 'dis-integrated' documents, fashioned by different players in the procurement process and not offering an easily appreciable integrated whole. The paper ends with the hope that new digital methods of information production will lead to better integrated and more easily readable 'wholes' in the new forms offered by building information modelling (BIM

9 Patrick Schumacher, 'Parametricism as Style - Parametricist Manifesto' (Dark SIde Club, 11th Architecture Biennale, Venice, 2008), http://www.patrikschumacher.com/Texts/Parametricism%20as%20Style.htm.

10 Schumacher.

11 'Online Etymology Dictionary', accessed 31 July 2017, http://www.etymonline.com/index.php?term=architecture.

12 Rob Imrie and Emma Street, Architectural Design and Regulation (Wiley-Blackwell, 2011).

13 The quoted statements are questionnaire heading used by Imrie and Street in section 5.3 "The Interrelationship between Regulation and the Practices of Architects". Imrie and Street.

14 Perhaps Stravinsky gives us the most explicit formulation of the self-regulatory nature of artistic practice, saying "The more constraints one imposes, the more one frees one's self… And the arbitrariness of the constraint serves only to obtain precision of execution". Igor Stravinsky, Poetics of Music in the Form of Six Lessons (Harvard University Press, 1970) p. 65.

15 Rob Imrie and Emma Street, 'Risk, Regulation and the Practices of Architects', Urban Studies 46, no. 12 (1 November 2009): 2555–76, https://doi.org/10.1177/0042098009344231.

16 'Perspecta 35 "Building Codes"', MIT Press, accessed 30 July 2017, https://mitpress.mit.edu/books/perspecta-35-building-codes.

17 Salomon Frausto, Bureaucracy, Hunch: No. 12 (Rotterdam : NAi Uitgevers/The Berlage Institute, 2009., 2009).Hunch: No. 12 (Rotterdam\\uc0\\u8239{}: NAi Uitgevers/The Berlage Institute, 2009., 2009

18 Tilo Amhoff, Nicholas Beech, and Katie Lloyd Thomas, 'Further Reading Required', Arq: Architectural Research Quarterly 16, no. 03 (2012): 197–99, https://doi.org/10.1017/S135913551300002X.

19 Liam Ross, 'Just Joking', ed. Arjen Oosterman, The Shape of Law, Volume, 38 (2014), http://archis.org/publications/volume-38-the-shape-of-law/.

20 Adam Jasper, ed., 'Corruption', Architectural Theory Review 20, no. 2 (4 May 2015).

21 Arno Brandlhuber, ed., Legislating Architecture, vol. 50, ARCH+ (GmbH: Verlag, 2016), http://www.archplus.net/home/news/7,1-11380,1,0.html.

22 'The Snozzi 7 | Legislating Architecture', accessed 30 July 2017, http://legislatingarchitecture.org/the-snozzi-7/.

23 I use the term here, and elsewhere within this dissertation, in the Schmittian sense: the "[s]overeign is he who decides on the exception", the functionally necessary subject-position from which law is written, interpreted and enforced. Carl Schmitt and Tracy B. Strong, Political Theology: Four Chapters on the Concept of Sovereignty, ed. George Schwab, University of Chicago Press Ed edition (Chicago: University of Chicago Press, 2006) p. 5.

24 'Recetas Urbanas :: Santiago Cirugeda :: Arquitectura Social', accessed 30 July 2017, http://www.recetasurbanas.net/v3/index.php/es/.

25 'Brandlhuber.Com: BRANDLHUBER', accessed 30 July 2017, http://www.brandlhuber.com/.

26 Perhaps the most obvious example of an architecture derived from buildings standards are the Hugh Ferriss' analysis of the 1916 'set-back' code, which predicted the 'set-back' skyscraper to come. See Hugh Ferriss, The Metropolis of Tomorrow, Facsimile of a 1929 Edition edition (Mineola, N.Y: Dover Publications, 2005).

27 In describing architectural knowledge as a 'deontic' combination of practical concerns, I'm drawing on Frank Duffy's characterization. In describing it as Utopian, I means specifically in the terms introduced through Foucauldian literatures on governmentality. See section 2.1.1 for a further definition of the 'utopian'. Francis Duffy and Les Hutton, Architectural Knowledge: The Idea of a Profession (Taylor & Francis, 1998).

28 Philippopoulos-Mihalopoulous draws out the 'incestuous intimacy' between law and architecture (or 'the city'), through his concept of 'lawscape'. See Andreas Philippopoulos-Mihalopoulous, Law And the City (Routledge, 2007).

29 It should be recognized here that I am writing from the UK, a country without a constitution, and whose legal system is based upon common law, derived from precedent. Different legal utopias exist in different context; the question of constitutionalism and the intent of its authors are, for instance, of great legal and political significance within US, for instance. It is worth noting, however, that in later chapters which dwell on the patchwork character of legal frameworks, north American scholars will be the principle sources, suggesting again that we are here dealing with questions of diverging utopias, as opposed to diverging practices.

30 I'm borrowing the term 'infrastructural unconscious' from Caitlin Vandertorp, who coins it in relation to the absent presence of mobility infrastructures – railways, airports, highways - in literatures on travel. The term will be seen to resonate with literatures on 'Infrastructure Studies' introduced in section 1. See Caitlin Vandertop, 'Travel Literature and the Infrastructural Unconscious', in New Directions in Travel Writing Studies (Palgrave Macmillan, London, 2015), 129–44, https://doi.org/10.1057/9781137457257_9.

31 Philippopoulos-Mihalopoulous, Law And the City. p. 9

32 Philippopoulos-Mihalopoulous. p. 9

33 I am echoing here Koolhaas' description of 'Junkspace'. See Rem Koolhaas and Hal Foster, *Junkspace/Running Room* (Widworthy Barton, Devon: Notting Hill Editions, 2013).

34 There are some exceptions to this general case. In Chapter 5 I depend upon a number of secondary sources for access to historical material, and so draw on the work of a number of architectural historians and theorists - Morton Schmorleitz, Meike Shalk, and Barrie Shelton – as well as texts by architects Rem Koolhaas, Kisho Kurakawa and Yoshiharu Tsukamoto.

35 'Aggregate', accessed 9 January 2019, http://we-aggregate.org/.

36 In the introduction to *Governing by Design* they define their topic, by way of a quote from the Foucauldian Anthropologist Paul Rabinow, as a study not of the high culture, politics and history of Modern Architecture, but of that '"middle ground where social technicians were articulating a normative, or middling modernism... pragmatic technicians seeking to find scientific and practical solutions to public problems in times of crisis."'.

Paul Rabinow, *French Modern: Norms and Forms of the Social Environment* (MIT Press, 1989).power and knowledge in France from the 1830s through the 1930s uses tools from anthropology, philosophy, and cultural criticism to make fascinating connections between diverse protagonists and domains. In each of these domains - ranging from medicine to the layout of colonial cities - Rabin ow describes the creation of norms and the search for forms adequate for understanding and regulating what became known as modern society. He also focuses on an unexplored middle ground between the masters of high culture and the experiences of ordinary life, which he calls \"middling modernism.\"","ISBN":"978-0-262-18134-1","shortTitle":"French Modern","language":"en","author":[{"family":"Rabinow","given":"Paul"}],"issued":{"date-parts":[["1989",1]]}}}],"schema":"https://github.com/citation-style-language/schema/raw/master/csl-citation.json"} P. 13,16 quoted in Daniel Abramson et al., *Governing by Design : Architecture, Economy, and Politics in the Twentieth Century*, Culture, Politics, and the Built Environment (Pittsburgh, Pa: University of Pittsburgh Press, 2012). p. vii

37 Catharina Gabrielsson and Helena Mattsson, 'The Architecture of Deregulations', Moderna Museet i Stockholm, accessed 9 January 2019, https://www.modernamuseet.se/stockholm/en/event/the-architecture-of-deregulations/.

38 Helena Mattsson, "Staging a Millieu" in Sven-Olov Wallenstein and Jakob Nilsson, *Foucault, Biopolitics, and Governmentality*, 1st ed., Södertörn Academic Studies (Huddinge: Södertörns högskola, 2013), http://sh.diva-portal.org/smash/get/diva2:615362/FULLTEXT03.pdf. pp. 123-132

39 The work of Albena Yaneva, herself a student of Latour, is perhaps the most systematic application of STS concepts and methods in the study of architectural design. Albena outlines her own approach in Albena Yaneva, 'Actor-Network-Theory Approach To The Archaeology Of Contemporary Architecture' (Oxford University Press, Oxford, 2013), http://www.manchester.ac.uk/escholar/uk-ac-man-scw:162772.

2. Context and Methods

Intellectual context, preparatory research & methodological reflection

2.1
Readings on Governmentality and Infrastructure Studies

The discursive and material formations of standards

This research project has been informed by readings on standardisation drawn from a number of related literatures; Anglophone neo-Foucauldian studies of Governmentality, Science and Technology Studies - particularly those associated with Actor Network Theory - and the emerging field of Infrastructure Studies. This section offers a review of that intellectual context, considering the three literatures sets in turn. It outlines the problems they raise with respect to contemporary government, the key concepts and methods used in their analysis, as well as the ambitions and limits of that analysis. In each case it concludes by noting the relevance of these methods for a study of building standardization, highlighting the ways in which the work of specific authors inform the object, concepts, methods and aims of this research project.

2.1.1 Readings on Governmentality Studies

In this study of decentred agency in building design, the work of Michel Foucault is an important theoretical reference. The possibility of a decentred political authority is central to his work, associated as it is with a repeated call to 'cut off the king's head' in political theory. We hear this call in *Power/Knowledge*[1], and again in the *History of Sexuality,* where he suggests that any attempt to theorize 'power' is necessarily connected with its legitimation:

> At bottom, despite the differences in epochs and objectives, the representation of power has remained under the spell of monarchy. In political thought and analysis, we still have not cut off the head of the king**.** Hence the importance of the theory of power of right and violence, law and legality, freedom and will, and especially the state and sovereignty.[2]

In order to shift theoretical focus away from power and its self-representation, his work studies instead "practical systems", practices and technologies that embed relations of authority within everyday life.[3] His celebrated studies of the prison and the clinic, for instance, argue that authority claims develop and are channelled through di-

verse and contingent social and epistemological frameworks, as opposed to being legitimated by a singular source of 'sovereignty'. That is, for Foucault, there are no *proper* relations of authority, and those that exist have emerged in a distributed way, only later gaining a sense of homogeneity and stability through discourse. Through an analysis of that discourse, he suggests, we can see how the problems and concerns of politics and science are, at any given historical moment, shaped by particular 'rules of formation', conceptual limits proper to their historical 'episteme'.[4] His work traces the mutually supportive relationship between these knowledge frameworks and the practices they rationalise, identifying 'discursive regularities' that occur across disciplines within a given period (his archaeological method), and how these transform within disciplines across time (his genealogical method).[5]

This work sets itself clear critical ambitions and limits, perhaps most succinctly illustrated through what Foucault calls the "paradox of the relations of capacity and power".[6] If knowledge and power are mutually constitutive, then our increased acquisition of knowledge - our Enlightenment - would seem necessarily connected to our increasing subjectification, even subjugation, within power relations. That is, knowledge might be seen to de-capacitate as much as it capacitates. His research is concerned, then, with the question; "[h]ow can the growth of capabilities be disconnected from the intensification of power relations?"[7] To this end, Foucault intentionally avoids any attempt to offer trans-historical principles of good government. The practice of criticism, for Foucault, is not that of proposing specific alternatives, but of seeing the potential for alterity within the given; problematizing that which we take for granted by demonstrating its 'fault lines', and 'powers of consolidation'. So, while his work does not seek to legitimate any specific political model, it does have a distinctive *disposition*; by identifying the assumptions and contingencies that underpin any given episteme, he attempts to demonstrate the mutability of social practices, render them open to transgression. His philosophical project is construed, not as a questioning of the possibilities of knowledge, but rather of knowingly rethinking that which appears socially possible:

> Criticism indeed consists of analysing and reflecting upon limits. But if the Kantian question was that of knowing what limits knowledge has to renounce transgressing, it seems to me that the critical question has to be turned back into a positive one: in what is given to us as universal, necessary, obligatory, what place is occupied by whatever is singular, contingent, and the product of arbitrary constraints? The point, in brief, is to transform the critique conducted in the form of necessary limitation into a practical critique that takes the form of a possible transgression.[8]

Shifting the Centre of Gravity of Governmental Action Downward

While Foucault's most celebrated works address the institutions of the early modern period, his later work - particularly his lectures at

the Collège de France between 1970 and 1981 - turn to focus directly on the discursive regularities of contemporary social practices. It is in these lectures – first in *Security, Territory and Populations* (1978) – and then more fully in *The Birth of Biopolitics* (1978-9) - that he develops the concept of 'governmentality'.[9] In the latter of these, Foucault offers a genealogical study of Liberalism, which he conceives – in terms that might strike us analogous to his own project – not as a coherent philosophy, but a means of critiquing government, a process of self-reflection within government. This lecture series charts those transformations in political thought - from Machiavelli to Wilhelm Ropke - through which questions of sovereignty and Right (political science as 'advice to the prince') are supplanted with questions concerning the national economy (political science as 'household management'). As in his earlier studies, this genealogy seeks to demonstrate how particular and novel power/knowledge relationships emerge as a consequence of the birth of the Human Sciences; new ways of knowing a population give rise to new governmental problems, and new technologies of governance. Broadly, we could say that this genealogy describes a process of "shifting the centre of gravity of governmental action downward" from reflections on legitimacy, to an increasing practical and technical imbrication with the health, safety, welfare, education and economic productivity of the population.[10]

The Plurality of Government

Foucault uses the term governmentality to name this shift, both within government, but also within his mode of analysis, giving the term two distinct, but related, connotations. On the one hand, this term denotes an object of study; not 'government' as a singular, discreet entity, but rather the 'governing-mentality' *per se*. That is, Foucault uses the term as a means to direct our attention away from the exercise of state authority by those in positions of political power, toward a more diverse and disparate array of practices and technologies that 'conduct conduct' in one way or other. These might operate at the scale of the individual, family, or institution, through common codes of conduct, or legal requirements. They include modes of other-government but also ethical concerns, practices and technologies of self-government.[11]

However, Foucault also uses this term to periodise a particular way that the state, in the current conditions of liberal democracy, thinks about governing. The implication of this overlap in meaning is to suggest that what characterizes the mentality of Neoliberal government is its heightened awareness of the self-governing capacity of the population. The result of the liberal critique of government, he suggests, is that state power increasingly attempts to operate on and through diverse, disparate and emergent govern-mentalities. What 'governmentality' names is therefore also a form of government that takes the population as its object, conceives of its role as capacitating rather than disciplining, and measures its success in terms of economics – both national economic performance, and the economy of government itself. He uses it to label the state of liberal thinking in post-war Germany, France, Britain and the US, where

dispersed modalities of authority - particularly scientific and statistical analysis of the national economy, and questions of health, safety and security - come to predominate over direct assertions of sovereign right, or active techniques of discipline and punishment.[12]

Non-Subjective Intentions

While Foucault used this term only in passing during his late work, it has been adopted by a number of Anglophone neo-Foucauldian scholars who have sought to define it more precisely as both a means and an object of study. In *Governmentality: Power and Rule in Modern Society*, Mitchell Dean offers a succinct summary of the work of such scholars, with a view to outlining their characteristic assumptions, and modes of analysis. As we will see, much of that work focusses on practices of regulatory governance, and the work of scholars noted here will be of particular relevance in later case studies. At this stage though, Dean's summary is useful in defining a number of terms, highlighted in bold, that will be used more widely within this dissertation. [13]

Studies in governmentality, Dean suggests, usually begin by identifying particular concrete '**problems**'. Governmental programmes – be they practices of self-government or authoritarian practices - entail a desire to intervene, to change a given circumstance. The first question to consider with respect to such programmes, then, is to identify who problematizes that circumstance, and why? Dean notes that, following Foucault, governmentality scholars assume that governmental problems do not pre-exist their discursive formation; they are not universals, but have contingent historical origins and trajectories. Likewise, he notes that the object of analysis for these scholars is to identify the particular way – within our current state of liberal democracy – that these problems tend to be shaped.

Dean suggests that we can understand how those problems are shaped through the interaction of four key parameters. Governmental programmes are typified, he suggests, by their '**rationality**'; that is, the liberal critique of government demands that authority (particularly state authority) constantly justify itself. Programmes of government are therefore means through which the actions of government itself, as well as those of its population, come to be limited through rationalisation. The rationality of government is itself dependent on specific forms of '**visibility**'; in order to govern an aspect of a population, one must first know about that aspect, render it visible. Governmentality is therefore a mode of authority through which the rationalities of government are themselves de-limited by specific epistemologies. Ways of seeing, knowing and acting are, in turn, technologically mediated. Governmental programmes always come with their own '**techne**', with materialities that describe limits of knowledge and action. Finally, governmentalities depend upon and produce '**identities**'; as opposed to disciplinary forms of authority, they depend upon the willingness of individuals to engage in self-government, assuming or renouncing particular subject positions.[14]

The critical dimension offered by these scholars, Dean suggests, begins with a recognition of the '**utopian**' dimension of government. All governmental action, he suggests – be it libertarian or tyrannical – contains an irreducibly utopian dimension; an assumption that the conduct of conduct is *possible*, that a different world can be constructed. Again, following Foucault, they assume that no governmental programme can be identified as absolutely good or bad, oppressive or liberative; they withhold from a comparative critique of idealisations. Rather, they tend to study disjunctions between the stated *intent* of a programme, and its practical *effects*. That is, they suggest that a non-ideological critique of government is possible, by highlighting discrepancies between what governments say, and what they do. It is by doing this, by identifying the '**non-subjective intentionality'** of governmental programmes that they suggest a means to study our condition of headless rule.[15]

The Utopia of Standards

Dean cites the work of Marianna Valverde, whose work we might use to exemplify an application of these concepts to questions of urban planning and regulation.[16] In *Seeing Like a City: The Dialectic of Modern and Premodern Ways of Seeing in Urban Governance* Valverde demonstrates the utopian character of comprehensive zoning in the US. Studying Toronto in the company of a city planner, she is shocked to learn of the prevalence of 'legal non-conforming use' as a zoning code, a means to inscribes the possibility of non-compliance within the law. Finding that up to 50% of the city is subject to formal or informal exceptions or micro—zoning codes, she suggests that critique of comprehensive zoning itself fails to understand the realities of practice.[17] In *Everyday Law on the Street* she likewise studies her native Toronto, this time through its claim to be the world's most 'diverse' city. Examining programmes intended to support democratic engagement she finds that instruments such as mandatory public consultation meetings often disadvantage those marginalized groups they are ostensibly designed for, who are less likely to attend. As such she argues against the rhetorical localism advocated by the city, and its policies.[18]

Dean cites the work of Pat O'Malley's as exemplary of a neo-Foucauldian approach to the discourse on risk. Dean suggests that O'Malley's work – as opposed to that of Ulrich Beck - demonstrates the political polyvalence of this concept, describing how it can be invested with different political purposes, associated at times with an increased socialization of hazards, at other times working towards individualization and the development of 'practices of the self'.[19]

This PhD shares some of the assumptions and adopts some of the terms outlined here through Governmentality Studies. Its opening move – to shift focus away from a concern for the architect's autonomy – follows an interest in studying the decentring of design authority. It suggests building standardization as a 'practical system' within which we can see how relations of authority and systems of knowledge become mutually imbricated, mutually supportive. It shares an assumption that such practices are historically specific and

politically polyvalent. And in its attempt to understand how these practices work, it finds useful terms and concepts within Dean's 'analytics of government'; it recognizes regulations and standards as means of rationalizing governmental action, dependent upon specific means of knowing and seeing the population, shaped by intervening technologies, and resulting in the formation of specific identities. Centrally, it finds critical purchase offered by the utopian dimension of standards, noting the way their effects diverge from their intents. What the PhD does not share, however, is Foucault's pre-disposition to transgress. That is, it is not assumed here that the purpose of understanding limitations is to break them; indeed, this disposition appears akin to the hubristic attitude of architects which the preamble set out, and tried to avoid. It is with this concern in mind, then, that the PhD also draws upon other intellectual sources.

2.1.2 Readings on Science and Technology Studies

The relationship between knowledge frameworks and social practices is not only a concern for political philosophy. A parallel set of questions are raised by the Sociology of Scientific Knowledge (SSK), and by Science and Technology Studies (STS)[20]. If for Foucault the central concern was to undermine the truth claims of political 'sovereignty', demonstrating their dependence upon specific social conditions of possibility - the central concern for these scholars - at least in the early work of the field - was to undermine the notion of *scientific* truth. That ambition was perhaps first defined by the 'Strong Programme' of sociology, developed in the Science Studies Unit, at the University of Edinburgh.[21] The central contention of that programme was that scientific facts, even when demonstrably 'correct', depend upon shared paradigms and communities of practice, from which they cannot be considered autonomously meaningful.[22] That is, just as Foucault shifted focus away from the question of power itself, studying those social practices that it depends upon and legitimates, so the sociology of scientific knowledge turned its attention away from the content of scientific claims, to study the forms of social practice that they depend upon and so reproduce.

While the concerns of these scholars are more tangential to problems of political authority, they coincide with those of govern-mentality construed in its broader sense. Indeed, as we will see, recent literatures in this field have made direct contributions to questions concerning regulatory governance and standardisation. This is because - while not looking specifically at the problem of state authority - they study the way that diverse actors collaborate toward distinct ends, contributing to questions of how social relations stabilise around particular ways of thinking and acting. Their findings are subtly different to those offered by Foucault. Where Foucauldian scholarship focussed on discourse analysis – studying written representations of specific knowledge frameworks – Science and Technology Studies tend to be ethnographic in focus –more concerned with what scientists *do,* than what they *say*.[23] Studying scientific work, these scholars found that while this depends upon the collaboration of a wide variety of people and things, each bringing their own con-

cerns and capabilities, this collaboration does not produce, nor depend upon consensus. They recognised that, even in terms of its own self-understanding, science is riven with controversy, and in terms of its social practices, it depends upon a wide range of other agendas and concerns. And in trying to explain how science is shaped by such concerns and agendas they gave less significance to the formation of 'discursive regularities', and more significance to material consistencies, to the standardisation of techniques and practices. They suggested that, through agreeing on consistent ways of acting, diverse communities are capable of 'collaboration without consensus', working together toward varied ends.[24]

Material Stability, Discursive Flexibility

Perhaps the best-known schema for how such collaboration occurs is that of Actor Network Theory (ANT), developed by Bruno Latour, Michel Callon and John Law at the Centre de Sociologie de l'Innovation, Paris, in the early 1980s. In Latour's *Re-assembling the Social*, or Law's *Sociology of Monsters*, these scholars describe how 'actors' with different and divergent objectives work together by forming 'networks' of collaboration; how they seek to translate their individual concerns into common terms; how they embody those terms within 'technical delegates', such as social practices and material artefacts; and so how the materiality of those means reflexively informs the ends of their activity. [25]

The process they describe closely parallels some aspects and terms familiar from Dean's analytics of government, but with subtle differences. From an ANT perspective, for instance, the formation of a network does not necessarily hinge around the production of 'identities'. At one level, this is because human actors don't always think about what they are doing; they can have actancy without concomitant subjectivity. But at another, it is also because not all actants are human. ANT places a great deal of significance on so-called 'non-human actors'; the materials, technologies, or animals that science – and other forms of human endeavour - depends upon, and are therefore shaped by.[26]

That is, while Governmentality studies recognised the difficulty of representing specific rationalities within particular technologies, ANT makes this difficulty its primary object of study. Scholars associated with this field seek to demonstrate the ways that we seek to 'enrol' animals, materials and technologies (as well as other humans) within scientific work. Like W.C. Fields, they note the tendency for such actors to behave in unexpected ways, their capacity to tell us things we didn't want to know, re-directing our attention to unexpected ends. [27] What is at stake here is not pointing out a difficulty for its own sake; rather, the ambition of ANT is to use this difficulty to describe what it is that scientific and technological cultures do *well*. If knowledge systems are heterogeneous and divergent, what makes one or another more or less useful? Recasting objectivity Latour argues that what makes scientific culture particularly dominant is not so much that it can tell us the 'truth' of nature, but rather that it is particularly good at using non-human

actants as 'allies' in the formation of diverse networks of collaboration.[28] Scientific and technological cultures are not stabilised by an overarching episteme; they gather around common 'things' in an attempt to understand and make use of them.

Immutable Mobility

In Latour's terminology, the things around which such practices gather are called 'immutable mobiles'. He outlines this concept, using a map as his example, in *Visualisation and Cognition: Drawing Things Together*. He asks, what is novel and scientific about the map that La Perouse brought back from his travels to China? It cannot be said to be more truthful, more accurate, than those that precede it, being simply a compilation of sketches made by the people he encountered on his voyage. However, he contends that the novelty, and the scientific character of the map, is precisely this ambition to 'gather' disparate information within a singular thing. That is – again shifting our focus away from the knowledge claim – Latour suggests we understand the map in its performative function, as a means to coordinate a range of concerns through a set of practices: commercial interests, capitalist spirit, imperialism, and the thirst for knowledge, facilitated and shaped by geometric projections, marine clocks, record keeping practices, and engravings.[29]

What makes such objects work well, he contends, is their material consistency and their interpretative flexibility. A map is 'immutable' to the degree that it exhibits characteristics that allow for consistent reproduction and apprehension; physical durability and reproducibility, conventions of scale, codes of legibility, etc. However, such objects must also be 'mobile', both literally and metaphorically. They must be able to be moved from place to place, used in different contexts, but also used in different ways; they must afford a degree of interpretative flexibility, providing some kinds of information to one group, another to others.[30] Building standards could, of course, be described in like terms. The standards of medieval masons touched upon in the introduction - those lengths of string and metal standing at the gates to cathedral towns – work in precisely this way, stabilizing aspects of practice, through materially consistent and legible technologies and practices, which permit the collaboration of diverse groups without establishing an overarching plan.[31] In both cases what makes the standard 'work' is its practical flexibility, as opposed to its discursive regularity.

Gathering around Things

This emphasis – which gives 'things'[32] a central role in the formation of knowledge frameworks and social practices – lends ANT scholarship a particular focus. Despite its title, the ambition of ANT scholarship is not to theorise, but rather to describe; these authors offer 'thick descriptions' of scientific and technological cultures, descriptions that trace the social and technical networks that subtend to truth claims. Latour suggests that this goal is achieved through textual descriptions that reveals the "string of actions in which each

participant is treated as a full-blown mediator".[33] This descriptive character does not make their work a-political. What is at stake here, from the early work of SSK scholars, to Latour's on-going work on the 'controversies' of science, is to de-stabilise technocratic claims, opening science to democratic discussion. And this representational ambition is given a more explicitly political inflection by other scholars, particularly by Susan Leigh-Star, whose work is grounded in gender studies and feminism; studying the hard work that it takes to produce and maintain social practices is, in her work, a means of identifying forms of 'shadow-labour' or 'invisible work' that systems of governance construct, but also sublimate.

Nonetheless, the critical ambition of this field might be seen to differ from that of Foucauldian scholarship. In "Why Has Critique Run Out of Steam: From Matters of Fact to Matters of Concern", Latour suggests that late-twentieth century intellectual culture – pointing particularly to critical-theory, deconstruction, and his own early work – has been a victim of its own political ambivalence, developing critical tools that are supportive of a radical relativism.[34] A focus on truth claims leads only, he suggests, to the identification of epistemological aporia. If a sociology of science is to positively shape what science does, he argues, it must shift in focus from 'matters of fact' to 'matters of concern'; it must move away from the deconstruction of truth, to a focus on how we build shared concerns. In doing so, he outlines a programme for criticism that might be read, not only as self-reflection, but as a tacit critique of Foucault:

> The critic is not the one who debunks, but the one who assembles. The critic is not the one who lifts the rugs from under the feet of the naïve believers, but the one who offers the participants arenas in which to gather. The critic is not the one who alternates haphazardly between antifetishism and positivism like the drunk iconoclast drawn by Goya, but the one for whom, if something is constructed, then it means it is fragile and thus in great need of care and caution.[35]

If we identified, in Foucault's critical project, a disposition toward transgression, to the critique of limits, the disposition of ANT scholars appears quite distinct; it appears concerned with careful construction, with describing every actor's role. While this project adopts assumptions and terms common to Foucauldian scholarship, then, it is more sympathetic to the disposition of Science studies. What the project takes from these literatures is an invitation to think of the built environment as a physically stable but discursively mobile object that prompts and facilitates the gathering of interested stakeholders, supporting their non-consensual collaboration. It understands standards and codes as means of formalizing the processes of negotiation and translation that occur between these objects and stakeholders. In doing so, it does not presuppose a value in breaking codes, diverging from standards, but looks first to describe the role of each actor, specifically that of the built environment itself, within the formation and re-shaping of our governing-mentalities.

2.1.3 Reading on Infrastructure Studies

If I have tried here to describe the similarities and differences between two literatures - Governmentality studies and Actor Network Theory – it is because the third set of literatures I wish to review combines aspects of both. The purpose of the preceding reviews, then, has been to contextualize this further set of literatures that coincide more directly with the scope and object of this study. Within the Sociology of Scientific Knowledge there is a field of study which focuses specifically on processes of regulation and standardization. In doing so, it brings the framework of Actor Network Theory to bear on the object of Governmentality studies. In this final contextual section I will offer a brief outline of this field – loosely referred to as Infrastructure Studies - describing the way that it makes use of concepts and methods introduced already. By doing so, this section will outline the theoretical frame through which standards have been considered in this project, and list a set of methodological cues that prompt each of its city studies.

Infrastructure Studies might be seen to have begun as sub-genre of the history of technology. Its progenitor is perhaps Thomas Hughes, through his work on Large Technical Systems and their governmental role.[36] In these studies - such as *Networks of Power,* a comparative history of electrification - infrastructures are conceived of physically. Hughes studies the large-scale fixed technologies through which the modern nation-state was formed; airports and runways, the power grid and the telephone, road and rail networks, and the public institutions of schools, post-offices and prisons.[37]

The term 'infrastructure', however, also has a broader meaning. Systems such as e-mail, electronic banking, and standards for meta-data content, or life-assurance qualification requirements, even the metrical basis of particular musical styles and the underlying structure of given language-groups, might be understood as infrastructures. More recent literatures in the sociology of scientific knowledge have sought to study infrastructures that are not necessarily physical, nor necessarily associated with the state; they study practices, concepts and techniques, as much as physical technologies, and concern themselves with the governing and self-governing practices of private companies, NGO's, industry, and professional bodies. That is, through this broader conception of infrastructure, the history of technology comes to focus on an object that overlaps the concerns of governmentality scholars and Actor Network Theorists.

Within this literature, the first thing that identifies a technology as infrastructural is its scale; infrastructure studies are not concerned with the design of small or bespoke objects or systems for use by clearly de-limited social groups. Rather, these scholars study technologies that are big in spatial and temporal ambition, universalizing and systematic in their logic. Infrastructures typically aim to be global in application, and future-proof in ambition.[38] The second quality of such infrastructures are their being taken-for-granted by

those who work with them; scholars of Infrastructure Studies are not typically concerned with technology as it is consciously thematised by a society, but rather as something that has become its naturalized ground, as something that has become invisible through frequent use.[39] The singular work of architecture – a spatially limited construction, on a specific site, for a particular client - is not an infrastructure. It does, however, depend upon a wide range of infrastructures; shared professional practices, disciplinary concepts and techniques, material supply chains, and tacit social norms, as well as the formals codes, regulations, rules and standards that are the subject matter of this study.

Standardised Governance

Processes of standardisation are then, for these scholars, exemplary forms of infrastructure. Indeed, a review of contemporary academic writing on standards reveals much of this to be completed by scholars in this field. Susan Leigh-Star, whose work we encountered through our review of Actor Network Theory, has recently conducted a number of studies on standardization. In *Sorting Things Out: Classification and its Consequences*, co-written with historian Geoffrey Bowker, she defines classification and standardization as important forms of infrastructure. Codes, conventions and standards – such as those that are embedded within our electronic equipment or online information - are the infrastructure that allows our contemporary, technologically mediated life to unfold 'as if by magic.'[40] To study such classificatory logics is to gain access to the epistemologies and politics that sub-tends to the 'smooth' quality of contemporary life. In her work with Bowker, she charts the way in which such processes of formalization butt up against folk-classificatory, non-formalised aspects of everyday life.

Leigh Star continued this work with *Standard's and their Stories: How quantifying, classifying and formalizing practices shape our everyday lives*. This collection of papers, co-edited with sociologist Martha Lampland, studies the way that standards codify and naturalize particular ethical positions. In common with concerns and methods outlined through Actor Network Theory, the focus of this collection is on the hard work of making standards operate 'on the ground'. Through ethnographic studies of the way in which local user groups work with, and work around, systems of standardization, she identifies within them representational problems, distributional inequalities but also opportunities for resistance.[41]

Practices of governmental standardization are directly addressed by Vaughan Higgins and colleagues in *Calculating the Social: Standards and the reconfiguration of governing*. This book draws attention to the importance of regulation and standardization as a contemporary technology of governance, recognizing them as means of conducting conduct 'at a distance'. Standards coordinate actors working in different geographical areas, in different social and economic contexts, and across public and private organizations. He likewise notes the limits of such governmental technologies: because of their interpretative flexibility, standards are liable to be turned

to other ends. [42] Most recently Laurence Busch has studied the unintended side effects of standardization. In *Standards: Recipes for Reality*, he describes the path-dependencies that standards create, the way they 'black-box' the assumptions they are based upon, again becoming open to misuse. [43]

Discursive Trap

In *Calculating the Social* Higgins et al reflect explicitly on the relative value of Foucauldian and ANT informed methodologies for the study of standards. They suggest that the governmentality literatures offer useful concepts and steps for analysing the *discursive* formation of programmes of government: these help to recognise regulations and standards as epistemological devices, means by which concepts - safety, convenience, or sustainability – come to be constituted, awarded the force of law, and marked out in the social and physical world. However, they suggest these literatures – as their name suggests – remain too focused on the 'mentality' of government. Higgins et al suggest the root of this problem lies in the distinction made in this literature between *rationalities* and *technologies* of government, whereby technology remains a representation of the rationality it bears, as opposed to a delegate with an actancy in its own right.[44]

> While studies of governmentality draw attention to how standards are constituted as objects of knowledge, and the consequences for practices of governing, this body of literature can be criticized for focusing primarily on rule at the programmatic level. This arguably limits the capacity for governmentality studies to engage in a meaningful way with the complexities of how governing works and achieves particular effects. Such a limitation can be traced to the distinction between rationalities and technologies of governing. Technologies are conceptualized as the technical means for making (discursive) rationalities of rule possible in a programmatic form. What is overlooked, however, is the material problematics of making such programmes workable in practice.[45]

Indeed, this question of emphasis might even be seen to lead to a reflexive error within such research, which might tend to perceive governmental programmes as overly coherent and univocal. Literatures on governmentality can often describe a world riven with micro-technologies of power, 'iron cages of bureaucratic discipline', but without seeing the ways in which people work with, around, against, and in ignorance of such mentalities, this conclusion may in fact be a projected assumption.[46] For Higgin's et al, the stress that ANT scholarship places on 'things', on interpretative flexibility, and the material effects of knowledge frameworks, are suggested as a way out of this reflexive trap.

Building Boundary Objects

Particularly important to this research project has been the work of

Susan Leigh Star. This is because, in her sociology, standards are seen to play a key role in stabilising social practices and knowledge frameworks. She outlines their role first in a paper co-authored with James Griesemer, *Institutional Ecology, `Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39*. That paper studies the development of standardized processes and practices at a zoological museum, describing how a wide group of stakeholders - game catchers, amateur naturalists, professional scientists from differing disciplinary backgrounds, patrons, administrators and hired assistants – came to develop standardised ways of working, without sharing the same ends or world-views.[47]

In that paper she outlines a schema of standardisation, one that occurs in three stages. It begins when a group of people are gathered together by a 'boundary object', a commonly apprehended thing, which is a concern or an opportunity for those involved. In this particular case, it is the collection of a zoological museum, its care, extension, and use. This first stage is already important, and distinguishes this ANT informed approach to a Foucauldian one. The 'problem' around which these actors gather is not conceived of, initially, as a discursive construct. It is a set of overlapping concerns, that are brought into relation by a physical 'thing'. Discourse enters the picture when, in trying to work together around this object, those actors attempt to translate their diverse interests and understandings. Star construes this process as one of navigating not only between different ways of knowing, but different levels of understanding. All individual actors, she suggests, have a detailed, understanding of their own concerns, which might be more or less complex; their local knowledge is 'well-structured' in her terms. However, their understanding of other people's understanding is limited, vague, 'ill-structured'. These well- and ill-structured ways of knowing coincide in the 'boundary object'; it is a thing riven by competing concerns, agendas, epistemologies. But the business of working together, she suggests, does not actually require consensus; one form of knowledge does not need to come to dominate over the others. What is important for collaboration is agreement over common terms and practices that allow different ways of thinking and acting to co-exist.

This is where the standardization of practices, terms and techniques becomes important; they are the point of contact between detailed, local concerns and broader, more general forms of understandings. The important point here is that those standards need not actually represent the mentality of any of the particular actors; technologies do not necessarily represent rationalities. For Star, what makes a standard work well is its ability to facilitate the co-existence of well- and the ill-structured understandings, offering them sufficient purchase on their common 'thing'; they fail when they cannot enrol their human and non-human participants in organised action, usually by becoming too detailed, too formalized, or by failing to provide adequate specificity. In either case, the network falls apart, and generates 'residual categories' those actors whose concerns have not been recognized. These outsiders, thrown out of the network, divide

or coalesce to the degree that they can find new things to gather around, and the process begins again.[48]

In attempting to describe the shaping effect of building design for governmentality, this dissertation adopts Leigh Star's schema of standardisation. That is, building standardisation is here conceived of as a process, within which the writing of rules is only one part. Building design is here considered an exemplary *boundary object*, an entity that is neither discursive nor material in nature, but is rather the intersection of a set of concerns, problems and opportunities, gathered by a physical thing. That is, the city – and in particular the city on fire – is here considered as an important pretext to governmental action, and to particular govern-mentalities. The writing of rules and standards – the practice of legislation – is here conceived as a means by which a varied stakeholders attempt to come to common terms, and to shared practices, in order to facilitate collaboration. Importantly, though, those terms and practices are not assumed to represent the rationality of any particular stakeholder group, nor to mark out a consensual 'discursive regularity'. Rather, they are construed as means to hold together different concerns, different ways of thinking and acting. Finally, the process of regulation itself – that is, of designing buildings in accordance with rules – is conceived of as an important part of this process. It is only through this process of being enacted that standardisation can succeed, or fail, to enrol human and non-human actants in some form of collaboration.

Residues, Textures, Indeterminacy, Mess.

Understanding the way that standards fail is important for Leigh Star, indeed, she suggests that this is where critique should focus, identifying the places where governmental systems fail to facilitate, fail to capacitate. In *Sorting Things Out* she provides a set of methodological pointers for researchers on standards, suggesting ways to detect such failures. To begin, she suggests we look out for the **Residues of ubiquity**. Infrastructures are large, nested systems that can appear to be ubiquitous and all encompassing. But they usually define outsiders, exclude specific people from their concerns. Who or what are the 'others' that a standard creates, and what effect does it have on these groups? She suggests, likewise, that standards often create **Cumulative mess trajectories**. While trying to solve one problem, governmental technologies often create other problems. These, in turn, legitimate further governmental action. Sometimes the side effects of governmental action pile up to such an extent that it is no longer possible to remember what the original problem was. She suggests looking out for situations where standards have become so embedded that the actors who work with them no longer remember their original purpose. Her work likewise focuses on the **materiality and texture** of infrastructures: Leigh Star reminds us that standards are not just ideational, or symbolic, but have materiality; they always require material delegates, such as drawings, pieces of paper, software formats etc. While they frame broad problems for a network at large, they bring a specific 'texture' and 'character' to that problem that is best understood by the actors who work closely

with them. The warp and weft of a standard is a space within which some actors carve out a certain space of freedom, redirecting given means to novel ends. Leigh Star likewise highlights the fact that Infrastructural systems such as standards are never built *de novo*; they rely upon existing systems, which they build upon, and recode. Working with infrastructures therefore requires a certain kind of **historical imagination.** Infrastructural designers, she suggests, need to recover the multivocality of the past, and of things, and be aware of how narratives of universality are constructed. Finally, she draws attention to **the practical politics of visibility**. When designing infrastructures, actors are faced with practical political decisions, in terms of the degrees of visibility to include in the system. Does it always benefit an actor or a group to be included within a system, to be seen by it? In some cases, invisibility might be more conducive to co-existence.

Building Boundary Objects

Leigh Star's work on standardisation is important to this research project, in a number of ways. Foucauldian literatures have already alerted us to the fact that buildings shape effect on governmental outcomes, as part of the *techne* of government. But Leigh Star's description of standardisation remind us that buildings are often the 'things' around which governmental problems emerge. She reminds us that standards are not purely discursive, but rather emerge from, and are re-inscribed into, the physical fabric of the built environment. Likewise, the methodological cues listed above - which combine concepts and concerns drawn from Foucauldian and ANT scholarship – are of particular relevance for this study. Indeed, the dissertation itself might be seen as an ambition to work through these specific cues in the field of building standardisation. Section 2.3 will return to these prompts and re-purpose them as the basis of this study's methodology.

2.2
The Reach of a Small Woman's Arm

On the Utopia of British Standard S813

The previous section outlined the context, ambition and methods that inform the forthcoming city case studies. Those ambitions and methods were developed through a preparatory study that reflected on an experience of professional practice that prompted this course of study, and offered it its first research material. I do not include that study in the main body of the dissertation, as it does not pertain directly to the problem of fire-safety, but offer a summary of it here, with two purposes: firstly, to offer the reader a fuller picture of the research trajectory undertaken in the project as whole; secondly to provide a practical example of the way in which concepts and terms drawn from Governmentality and Infrastructure Studies have here been construed to offer insight into processes of building standardisation, so linking the theoretical concerns of the thesis to the technicalities of its subject matter.

Blind Spots of Sovereignty

The preamble noted how the writing of rules affords the opportunity to stand above them. Conventional architectural practice affords no shortage of examples. The legal-architectural problems described in this section were first encountered while working on a residential development project in Edinburgh. The site for this development fell within a masterplan prepared for, and administered by, a publicly appointed profit-making quango, Waterfront Edinburgh Leisure (WEL). That masterplan offered an elegant diagram of what we might call the 'blind spot' of sovereignty. It established a set of urban rules – land-use categories, a consistent eaves height, the need to build to the heel of the property line – and used them to define a series of plots which landowners could release to developers (fi. 2.1). Within this masterplan, however, a single plot was not listed as being subject to any of its requirements. This plot of land was owned, and was subsequently developed, by WEL themselves (fig 2.2), acting here as owner, developer, architect and regulator. The planning application for this site, while citing the masterplan, nonetheless introduced a novel concern; the need for an 'accent building' to act as foil to the (proposed) regularity of its (unbuilt) context.[49]

Breaking with the mandatory eaves height, and stepping back from the regulatory line of the pavement, the development volume and urban prominence of this one site was thus relatively increased. This example shows how even innocuous morphological rules afford, to those who write them, a kind of "transgressive authority" which can be used to construct market advantage. [50] As it transpired, this particular ploy backfired. Due to the market contraction of 2008 this building was one of the few plots to be built within the development framework. Speculative capital failed to render the disadvantageous rules that would have made this publicly funded exception, exceptional. History has rendered its ploy illegible, and left the resultant building un-lettable, an isolated fragment bereft of its infrastructure. (fig. 2.3)

Incomplete Rules

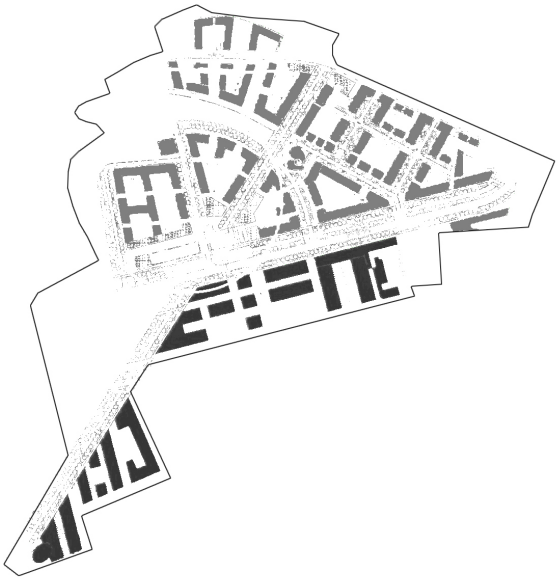
While this story is not without its own interest, the hubris it evidences is precisely *not* the focus of this study. Rules are here relatively transparent means to construct and assert specific subject-positions. What this study is concerned with, rather, is the properly *headless* operation of rules, the way they act when separated from the interests of those who write them. The same project offers a useful, contrasting example. That commission involved converting an existing warehouse building into residential use. Within the design process, a legal-architectural challenge emerged; being listed, it was a requirement that the existing windows be retained in their current scale and character. However due to the size of the windows, they did not comply with current technical standards for safe cleaning. There were no available window systems that could resolve these two ambitions technically, and pre-application discussions with the relevant statutory authorities could not clarify whether one rule should take precedence over the other. As such, it was impossible to prepare a design that would comply with all relevant rules, a decision on whose interpretation could only be made, after the submission of a planning application, by the relevant committee.

That is, this simple design challenge offered a practical example of one of the fundamental problems of rules, that of their constitutive incompletion. Following the decisionist tradition of Carl Schmitt – which will be discussed further in the following section - no rule can be said to include within it all those further rules required to ensure its correct application. [51] As such, he argues, rules must be suspended, even in the act of following them, through recourse to a decisive authority that interprets them, in this case, the planning committee. It was my engagement with this particular project that prompted my first enquiry into the subject of buildings standards, the nature of their authority, and problems of their application. That study began with an enquiry into origin of Scotland's building standards, and the way that they translate broad governmental ambitions into detailed technical standards, which I summarise below.

fig. 2.1 (above left)
Residential and commercial development plots, Granton Waterfront
Diagram by Author. Adapted from diagram "Waterfront Edinburgh Masterplan" in Waterfront Edinburgh Leisure. 'Granton Waterfront Madelvic Plot 8 Design Statement 05_01543_FUL-Design_Statement-249696(1)'. submitted to City of Edinburgh Council Planning Department, 5 May 2005.

fig. 2.2. (above right)
Madelvic Plot 8 site boundary
Diagram by author

fig. 2.3. (below)
Madelvic Plot 8 Streetview.
Google "Streetview", accessed 20.02.18



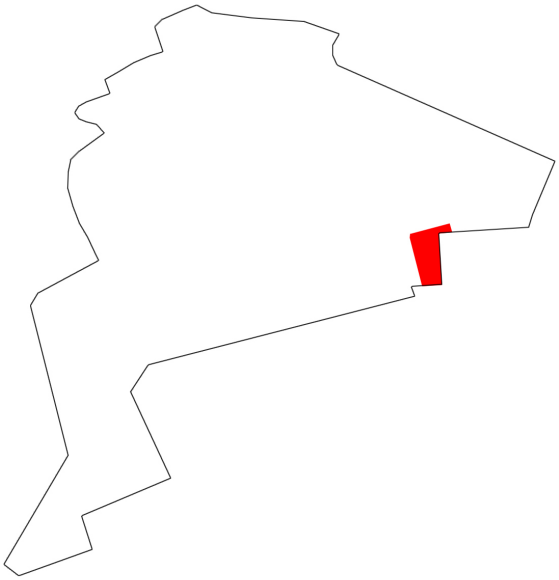


Table A.1 — Reach capabilities for the UK adult population (under age 65)

Dimensions in millimetres

Reach capability	Gender	Mean	5th%ile (i.e. includes 95% of adult population)
Shoulder (acromion) to grip (See Figure A.1)	Male	662.5	607.2
	Female	608.5	556.4
Overhead grip reach (See Figure A.2)	Male	2 093.2	1 941.5
	Female	1 944.3	1 824.7
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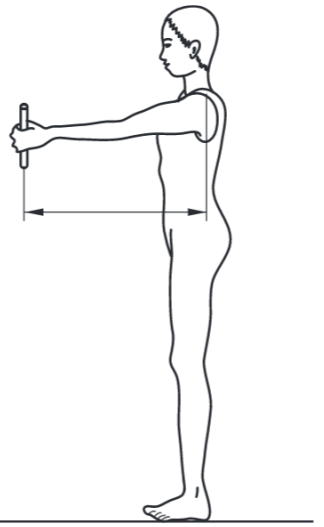

Measured from the bony tip of the shoulder (acromion) to the tip of the centre of a rod gripped vertically in the hand. The arm should be straight.

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Figure A.1 — Shoulder (acromion) to grip

fig. 2.4 (above)
"Reach capabilities of the UK adult population"
Table A.1, British Standards Institute. *BS 8213-1:2004 - Windows Doors and Rooflights. Design for Safety in Use and during Cleaning of Windows, Including Door-Height Windows and Roof Windows. Code of Practice.* BSI, 2004.

Anthropometric data on reach capacity out, and overhead.

fig. 2.5 (below)
"Shoulder (acronium) to grip"
Figure A.1, *BS 8213-1:2004 - Windows Doors and Rooflights*. BSI, 2004.

Diagram of measurement for reach capacity out.

Patchwork Standards

As Peter Frankling outlines in 'Construction Regulations in Scotland', the origin of Scotland's system of building regulations can be traced back to the 12th century and the emergence of the Dean of Guild's courts. [52] The Dean of Guilds were groups of magistrates designated responsibility for buildings, and their courts adjudicated on matters of both design and maintenance. By the 14th century these courts had developed into the trade associations and guilds that administered those rights and privileges awarded to masons and craftsmen through the 'freedom' to practice within Royal Burgh's. It was not until the 18th century that this medieval and mercantile jurisdiction began to engage with concerns we would recognize as the basis of contemporary building standards. This occurred first in Scotland through a series of Police Acts introduced by the Burghs, empowering them to pave, light, sanitise and watch over the public spaces between buildings. Rather than supplanting the guilds authority, the Police Acts extended them, enrolling the existing apprenticeship schemes and protectionist trade policies within a new governmental concern regarding public order.

The scope of building regulations began to extend into the interior of private dwellings during the early 20th century, when the Department of Health issued its first discretional model-building by-laws. Building practices have, from that point onward, become increasingly tied to initiatives concerning public health, well-being, and even sexual propriety[53]. But up until WWII, building regulations remained a series of piecemeal requirements, enforced by trade bodies, educational practices and local by-laws. It was only the exigency of post-war reconstruction, and the promise of innovative construction materials and techniques, that created the need for a specific Building Act, empowering a comprehensive and mandatory set of nationwide building regulations. In Scotland, this was the *Building (Scotland) Act,* originally of 1959.[54] This act offered a single and comprehensive document enabling ministers to write and enforce building standards concerning a range of governmental ends. The scope of those ends, however, indexes the diversity of concerns that had emerged around buildings up until that point. The 1959 act was principally concerned with issues of public safety and public health, including regulations concerning structural stability, fire performance, the risk of accident, sanitary provisions, and environmental amenities including access to daylight, fresh air, and protection from noise. Since then additional requirements have been added concerning emergent political concerns; environmental impact, accessibility, and energy consumption. The result is a complex document that compounds contrasting and even competing agendas.[55]

Rule of a Small Woman's Arm

By looking in more detail at the rules that apply to our specific case, we can gain more insight into the way these broad governmental concerns come to be shaped by specific assumptions, rationalities, and technologies. *The Building (Scotland) Act 2003* is the current Act of the Scottish Parliament that empowers ministers to write and

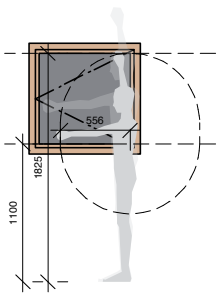
enforce building regulations. It states its fundamental purpose as the need to design buildings that:

> [S]ecure the health, safety, welfare and convenience of persons in or about buildings and of others who may be affected by buildings or matters connected with buildings; [to] further the conservation of fuel and power; and [to] further the achievement of sustainable development. [56]

The aims of this act are further defined and enforced, though, through a second tier of documents, the Scottish Government's *Technical Guidance* publications.[57] These are published in two handbooks, concerning *Domestic*, and *Non-Domestic* buildings. Each handbook contains a series of sections, concerning the broad topics defined by the act: structural stability, fire performance, environmental impact, accessibility, safety, noise and energy consumption. Each of those section refers back to the act in defining its broad governmental purpose. Section 4, which concerns safety, begins by stating that buildings must be designed to safeguard the safety, welfare and convenience of building users. Safety is here defined, in line with the International Standards Organisation, as a "a state of freedom from unacceptable risks of personal harm".[58] These rules therefore construe the problem of safety as a sub-category of the broader question of 'freedom', that central concern of liberal government.

Section 4 of the domestic handbook then goes on to review a series of risks posed by building, and to establish a set of Mandatory Standards, intended to free building users from those risks. Standard 4.8 identifies in particular those risks to personal harm posed by accidents occurring in buildings, and demands that buildings be designed to minimize that threat. It states that every building must be designed such that "both faces of a window are capable of being cleaned such that there will not be a threat to the cleaner from a fall."[59] Beyond that Mandatory Standard, the document offers a series of further "Guidance Notes", non-binding suggestions whose satisfaction would nonetheless be deemed to comply with the law. Guidance Note 4.8.3 suggests that falls account for most window-cleaning accidents, and that these usually occur from loss of balance during over-extension of reach. It recommends that transparent or translucent glazing to be designed so that it may be cleaned without the need for over-extension. Specifically, it advises that:

> Any window, all or part of which is more than 4 m above adjacent ground, should be constructed so that any external and internal glazed surfaces can be cleaned safely from [either]: inside the building in accordance with Clause 8 of BS 8213: Part 1: 2004; or a load-bearing surface large enough to prevent a person falling further. [60]



For the decisive clause, then, the reader is directed to another publication, *British Standard 8213: Part 1: 2004 – Windows doors and rooflights. Design for safety in use and during cleaning of widows,*

fig. 2.6. (above)
"Window types: risks in use and when cleaning the outside of the window from inside"
Table 1. *BS 8213-1:2004 - Windows Doors and Rooflights*. BSI, 2004.

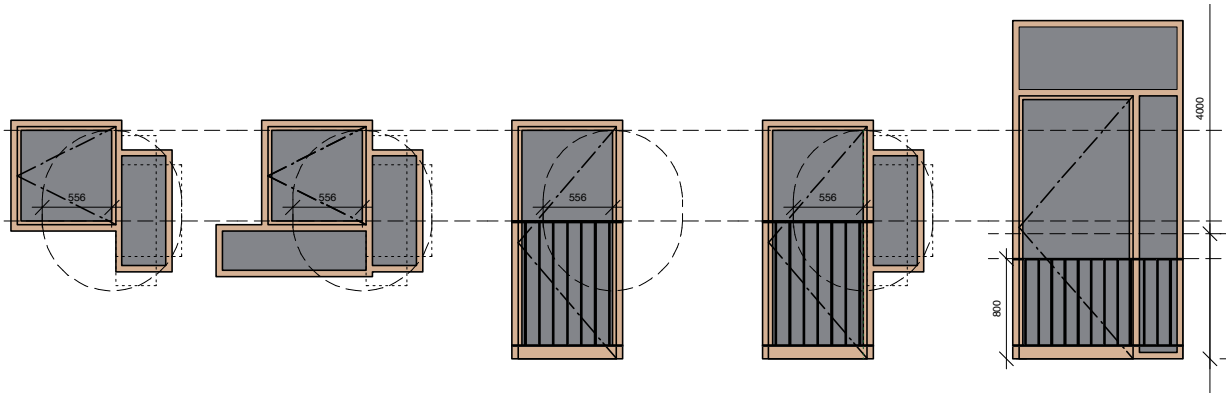
Example risk assessment for side hung, open in window type.

Table 1 — Window types: risks in use and when cleaning the outside of the window from inside

Window type	Risk in use	Risk in cleaning	Comments
Side hung, open-in	Collision with windows inside Falling out of window Window slamming shut	Falling out of window Window slamming shut	Safety restrictor should be fitted depending on risk assessment A retaining device can be fitted for cleaning depending on risk assessment

fig. 2.7. (below)
Diagramming BS8213: Maximum permissible window sizes. (detail)
Liam Ross and Vsevelod Kondratiev-Popov

Maximum permissible window opening sizes for side hung, open in windows. Windows shown in four configurations; opening light, opening light with fixed side light, opening light with fixed side light and external balustrade, opening light with fixed side and fan lights and balcony.




Side Hung / Open Out
Non-projecting butt hinges
Diff cult to clean from within. Risk of collisions outside. Risk of falling out during use and cleaning. Safety restrictor should be considered.
Side Hung / Open Out
with offset projecting hinges.
Gap between casement and frame should be at least 95mm. Risk of collisions outside. Risk of entrapment. falling out during use and cleaning. Safety restrictor should be considered.
Side Hung / Open In
Non-projecting butt hinges
Risk of collision with window inside. Risk of falling out during use and cleaning. Safety restrictor should be considered.
Tilt and Turn
Tilt function provides ventilation without risk associated with opening. Risk of collisions when open in turn mode. Risk of falling out during use and cleaning. Safety restrictor should be considered for turn mode.
Top Hung / Open Out
Non-projecting butt hinges
Diff cult to clean from within. Risk of collisions outside. Risk of falling out during use and cleaning. Safety restrictor should be considered.
Louvres
Openings between louvres should be 95-100mm. Risk of falling through window (glazing only restrained on short edge). Risk of entrapment. Positive hold-open position should be provided.
Bottom Hung / Open In
Safety-restrictor hinge
Risk of collisions inside. Risk of entrapment. Weight of sash a limiting factor.
Horizontally Pivoted
Fully reversible
Risk of collisions outside. Risk of falling out during use and cleaning. A reversing catch should be f tted to secure window during cleaning.
Vertically Pivoted
Nominal 90 degree opening
Risk of collisions outside. Risk of falling out during use and cleaning. A catch should be f tted to secure window during cleaning.
Horizontal Sliding
Nominal 90 degree opening
No risk of collisions. Cleaning only possible in array, if all sashes pass, or if f xed light removable. Risk of falling out during use and cleaning.
Vertically Sliding
Side hinged sashes for cleaning
No risk of collisions outside. Risk of falling out during use and cleaning. Weight of sash is limiting factor.
N/A

including door-height windows and roof windows, code of practice, published by the British Standards Institute. [61] Its advice is not itself legally binding, but they are awarded the force of law through citation within the Mandatory Standard. This particular document begins by providing an exhaustive list of the risk of accident posed by the use and cleaning of windows and rooflights. It considers the danger of collision, entrapment and falls posed by a range of commonly available window types: vertically and horizontally sliding; top, side, and bottom hung; horizontally and vertically pivoted; tilt-and-turn, louvers and fixed lights. It considers how the configuration of lights affects their reachability, mitigating or attenuating these dangers; allowing occupants to reverse or open a window inward, or requiring them to reach out, to reach through an adjacent opening, or to clean from the ground or an access deck (fig. 2.6).

The document itself cites further studies on anthropometrics (*Older Adultdata: The Handbook of Measurements and Capabilities of the Older Adult*[62]) that determines the mean and fifth-centile reach capability of older men and women. The judgement as to what constitutes an acceptable exposure to harm comes in Clause 8, which states that to protect the population as a whole from the risk of falls, windows should be cleanable from inside by 95% of the adult female population (aged 65 and under), without the need for stretching, or for the use of cleaning 'extenders' (squeegees). (fig. 2.1).

> From these statistics it appears that only around half of the adult female population would be able to reach out approximately 608 mm, without either leaning forward or using implements to extend reach. Similarly, only around half of the adult female population would be able to reach overhead to approximately 1 944 mm… The statistics indicate rather shorter reach capabilities than many current window designs would require for safe cleaning. In guidance on the use of data, the scenarios included with the DTI statistics suggest for example that design for reach (and force) should accommodate the 5th percentile of the UK adult population, i.e. within the capabilities of 95 %. This would indicate limits of around 556 mm for reaching
> out, and around 1 825 mm for overhead reach.[63]

fig. 2.8.
Diagramming BS8213: Maximum permissible window sizes.
Liam Ross and Vsevelod Kondratiev-Popov

Maximum permissible window opening sizes for multiple window types. Each shown in eight configurations; opening light, opening light with fixed side and or lower lights, opening light with external balustrade, or external balustrade and side light, opening light with fixed side and fan lights and balcony, multiple opening lights with maximum fixed intermediary lights.

The Governmentality of BS8213

This brief study suggests some initial ways to reflect on standardisation as a facet of governmentality. What struck this author initially was the way that the history of Scottish Building Standards – even in this initial glance - track broadly those transformations in state authority that Foucault charts in *The Birth of Biopolitics*. The development of the Scottish Building Standards suggests a process that shifts from direct assertions of Sovereign right – royal proclamations of 'freedom' for specific trade associations – into an increasing engagement with concerns for the health, safety and welfare of a population. They suggest processes through which such authority claims come to justify themselves rationally. If those standards –

by professionalising aspects of the construction industry – continue to have a relationship with trade monopolies, through the process of standardisation, those monopolies can be seen to have assumed an increasing responsibility for other governmental concerns. The 'freedom' to practice as an architect today is connected to an agreement to assume a responsibility for concerns over policing, health, safety and wellbeing, economic productivity and its sustainability.

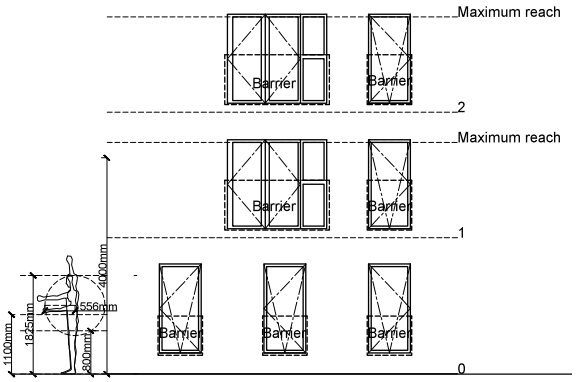
We can also see how, through this process, the broad aims and ambition of government come to be shaped by particular ways of seeing, and by particular technologies. The requirements of BS8213 are shaped by particular ways of knowing the population (anthropometric statistics) and by particular technologies (existing systems of window opening). Through them, discursive abstractions – such as 'safety' and 'freedom' - comes to be marked out in reality, awarded the force of law. Those abstractions materialise in the distance between the 'bony tip of the shoulder' of the 5th centile smallest women in the UK, and the 'centre of a rod gripped vertically' in her hands. If it is 556mm we are *safe*, if it is 557mm we are *unsafe*.

It would be easy to find some 'fault lines' within such decisions, which can often appear arbitrary. In this particular case, it might seem odd that wheelchair users are excluded from consideration (it is assumed that this population will use 'extenders' to clean their windows), at the same time as the use of 'extenders' is presumed unsafe for the rest of the population. This is a minor technicality but one which – as we will see – has a concrete shaping effect on the built environment of Scotland. But more so, I think we could say that it is within such technicalities that we arrive at a very central concern for the liberal problematic of government, at least as identified by Foucault. If liberal governmentality concerns itself with the 'management and organisation of the conditions in which one can be free', Foucault suggests that, "at the heart of this liberal practice is an always different and mobile problematic relationship between the production of freedom and that which in the production of freedom risks limiting and destroying it".[64] That is, within this govern-mentality, 'freedom' is not a given, a universal, but something which has to be actively constructed, and constructed through specific forms of limitation, control and coercion. Those limitations are construed to secure what Isiah Berlin would define as our 'negative liberty', our freedom from threats *to* our freedom ('safety' is here defined in precisely these terms).[65]

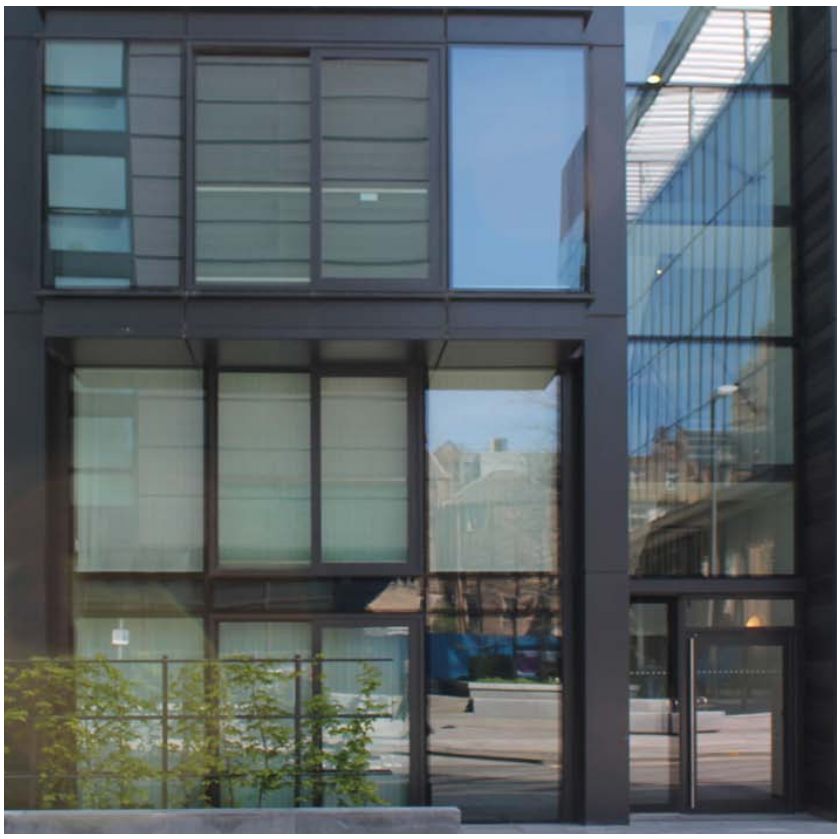
fig. 2.9.
Springside, Fountainbridge
Photograph Anna Raymond.
Diagram by Liam Ross and Anna Raymond

Compliant fenestration, 1825mm high inward opening widow w/ 1100mm barrier.

In the line drawn here between 556 and 557mm - a line which separates the safe and the unsafe, positive liberty and negative liberty - we can see something like Foucault's 'paradox of capacities and power'. Implied within it is a judgement that what we are freed *to* is worth more than what we are prohibited *from*, that the net effect of this governmental action more, or less, capacitating. That is, within the liberal critique of government, opposition to such rules emerge when their net effect is seen to be decapacitating, when the limits they impose outweight the freedoms they secure. But while there may be some reasons to question this judgement, that was not the ambition of this project;[66] rather, what inspired this initial study


Maximum reach
Barrier
Barrier
2
Maximum reach
Barrier
Barrier
1
Barrier
Barrier
Barrier
0
1100mm
1625mm
556mm
1000mm
300mm


Maximum reach
2
Maximum reach
Cleanable from ground level
1
0
1100mm
1625mm
1556mm
4000mm
800mm



was an ambition to understand the practicalities of this particular rule, the way that its effects might differ from its stated intents. So while study of the standard itself allowed us to understand one aspect of its 'utopia' – an ambition that the smallest and weakest in a community be assured a form of self-sufficiency – to study this further the author engaged in a parallel complimentary form of study, one which engaged more closely with concerns and methods associated with Infrastructure Studies.

Diagramming Standards

Alongside this study of the regulatory documents themselves, then, the author conducted two forms of by-design analysis. First, a series of analytic diagrams were produced to determine the architectural implications of BS8213. Second, a survey of Edinburgh's built fabric was conducted, in order to assess its compliance with these requirements. Alongside those studies, a series of interviews were conducted with regulators, architects, developers, window cleaners and building occupants to understand the practical implications of the code. This material is presented in Folio 1, but summarised and drawn upon in the below.

By producing a series of analytic diagrams illustrating the requirements of BS8213 (something which is not included in the standard itself) the relationships between window technologies and rules on reach limitation were made clear (see fig. 2.7). Taking each kind of window noted by the standard, the author drew out the maximum permissible window size for a range of configurations (see fig. 2.8). This first study showed how onerous the requirements of BS8213 are in practice, effectively outlawing domestic windows higher than 1825mm, a maximum head height that is only 70 mm higher than the average Scottish adult male. It illustrates how effective the inclusion of a balcony is in increasing legally permissible glazed area. But the diagrams also interpolate some consequences not directly stated by the standard. Outward opening windows are shown to be effectively prohibited, their maximum permissible size being further limited by the need to reach *around* when cleaning. The comparative study showed that, without a balcony, the most effective way to maximize glazed area is through an inward-opening door-like window, with a balustrade (a 'Juliet balcony'); finally, in terms of the particular problem that prompted this study, it demonstrated that, to achieve the tallest permissible window (for instance, where renovating large existing openings) the best window technology is a pair of vertically sliding, inward opening sashes. This is, in fact, the most common form of window in Scotland, an arrangement referred to as the 'Edinburgh Easy-Clean Window System'.

fig. 2.10.
Quartermile, Old Town
Photograph Anna Raymond.
Diagram by Liam Ross and Anna Raymond

Non-compliant fenestration, Full-height fixed or sliding glazing, not reachable from within.

By comparing these diagrams with a survey of the built fabric of Edinburgh, however, some other things also became evident. While the code would seem to support the vertical sash-and-case windows, common to most Georgian or Victorian buildings in the city, in fact it tends to render these non-compliant, their size being greater than the dimensional limits set by the standard. Any work to these buildings – such as the listed warehouse to be renovated - will necessitate

a reduction in widow size, or a breach of code. On the other hand, in many new developments, the code seems well complied with. In particular, the facades of recent low-cost volume house-builder developments, when built on peripheral or sub-urban sites, read like the clauses of BS8213 in brick-and-mortar (fig. 2.9). Balconies and Juliet balconies are used extensively in these developments allowing for the largest possible windows. However, on more expensive developments, especially those on city-centre sites, very few buildings were found to comply with this code. These buildings routinely include windows that are much larger than the code permits, indeed sometimes feature fully glazed facades with no provision for cleaning from within whatsoever (fig. 2.10). This non-compliance was particularly prevalent in designated Conservation Areas, where new buildings generally featured windows of a similar size to their historic context (2.11). Within these areas, a further type of window design was evident, which synthesized qualities of the compliant and non-compliant windows above. Mid-market residential developments in Edinburgh's conservation zones make a conspicuous use of spandrel panels, grouping multiple windows within one structural opening. By doing so, they attempt to bring the small windows permitted by BS8213 into dialogue with the large openings of their historical context (fig. 2.12).

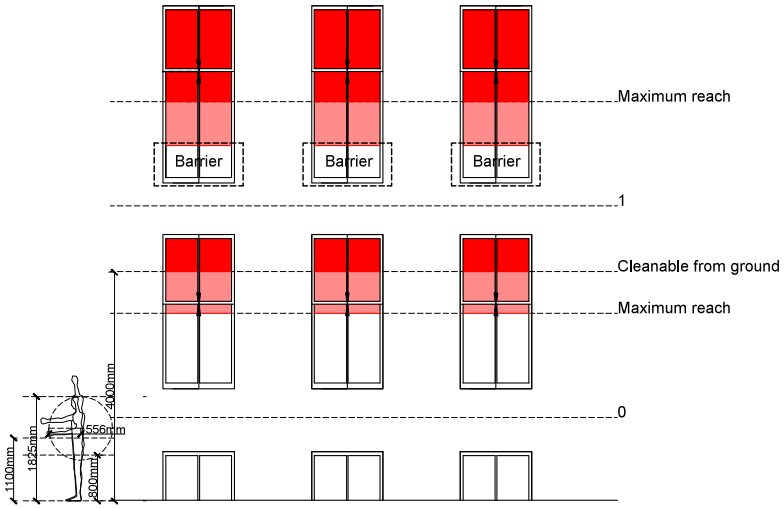
Contradictory Regulations

That is, a survey of Edinburgh's built fabric showed that the specific problem that prompted this enquiry was, in fact, widespread, prompted by a contradiction between planning guidelines and technical standards. The city's Local Plan states that the refurbishment of listed buildings, and new developments within conservation areas, are only permitted where they "preserve or enhance the special character or appearance of the conservation area and are consistent with the relevant conservation area character appraisal"[67]. The New Town Conservation Area Character Appraisal, as an example, recognises the regularity, and generous scale and proportion of windows in central Edinburgh as being of special value, and supports design guidance requiring new buildings to be designed with windows of a similar size. While these box-sash windows were themselves an eighteenth-century innovation in design for safe cleaning, their dimensions represent a different anthropometric standard to BS8213. The large size of these neo-classical windows exhibits an exaggerated bodily proportion, rather than indexing the minima of anthropometric data.

fig. 2.11.
St Vincent Place, New Town
Photograph Anna Raymond.
Diagram by Liam Ross and Anna Raymond

Non-compliant fenestration. Vertically sliding box-sash windows. Upper sash does not lower to under 1825mm. Outer face not reachable within 556. Barrier obstructs reach via water-fed-pole,

Interviews with the architects and owners of such developments revealed the ways in which this legal contradiction is typically resolved. In Scotland, non-compliance with the requirements of BS8213 is permitted as long as a factoring agreement attached the title deed of the property requires the windows be cleaned professionally. While this possibility is not stated within the technical or planning guidance literatures attached to the subject, it is, in fact, common practice within high-value private developments, where a demand for large windows dovetails with the marketability of this service arrangement. Marketable as they may be, these arrange-


Maximum reach
Barrier
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1
Cleanable from ground
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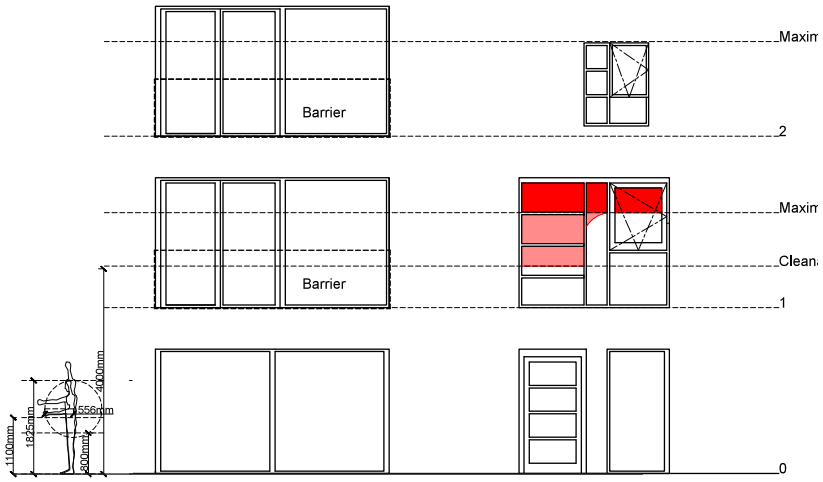
800mm


Barrier
Barrier
Maxim
2
Maxim
Clean
1
0
1100mm
1800mm
556mm
900mm


DRM
8
Eyre
Place

ments bring with them significant burdens, entailing a service contract that continues in perpetuity.[68] One particular project, the St Vincent Place development by Oberlander architects, illustrates the complexity of these arrangement, as well as the 'ambiguities of role ascription' that this regulatory framework creates for architects (fig. 2.11). Familiar with these contradictory legal requirements, the architects of this development did not actually attempt to design the façade themselves; rather, they simply went to the council and asked them what to do.[69] Large heritage windows, offered exemption from the technical standards, were the only permitted design route. But difficulties emerged, however, when the window-cleaner submitted a method-statement. Heritage consultants required the project to include faux-Georgian wrought-iron window boxes, which simultaneously acted as fall-protection for the mandated (but also non-compliant) low-level cills. These window boxes obstruct the reach of water-fed poles. As such the title deed for the property had to include a requirement for the occupant to be at home to allow access for a professional cleaner to enter the property, in order to clean the bottom-most 300mm of the external faces of the lower sashes. As such, we might say, the designed object itself could not resolve the contradictory legal ambitions placed upon it, which created residual requirements expressed as service contracts and owner-obligations.

Non-subjective Intent

That is, this parallel study reinforced for this author the *infrastructural* character of such standards; for the actors involved in the design of the buildings studied above, it was not necessarily important that they uncover or adopt the *mentality* of BS8213. The effects of this codes, in the particular buildings considered here, were shaped by a range of overlapping govern-mentalities; by the concerns of planners, regulators, manufacturers, designers, developers, contractors and occupants. These interests and concerns were themselves shaped by a range of technologies, each of which brought with them their own texture, their own materiality. The limitation of reach intersects, for instance, with available window technologies, with economic, aesthetic, and other governmental concerns, to steer design in ways not anticipated by those who wrote the standards; the height of a protective barrier, the length of a water-fed pole, the spacing of heritage ironwork, the working day of a window-cleaner and the domestic life of an occupant all compound and intersect in the design of St Vincent Place.

fig. 2.12.
Eyre Place, New Town
Photograph Anna Raymond. Diagram by Liam Ross and Anna Raymond

Large glazed (mostly) permissible due to three techniques; narrow access balconies (c. 600mm deep); glazed arrays using side and lower lights; larger arrays where reachable from the ground; multiple arrays grouped within single expressed 'opening'.

These varied factors can aggregate such that the effect of the standard is quite different to its stated intent. In this case, while the stated ambition is to ensure that occupants can clean their own windows, its effect in practice is quite different. Indeed, we might even say that in practice BS8213 mitigates *against* occupants cleaning their own windows; its onerous requirements define the majority of existing windows within Edinburgh as unsafe, and prompt developers to seek legal and architectural measures that design-*out* the possibility of occupant cleaning. In doing so, it accidentally formalises a socio-economic symbolism of window design; small = poor, big = rich. While such an effect might of course occur through consumer choice,

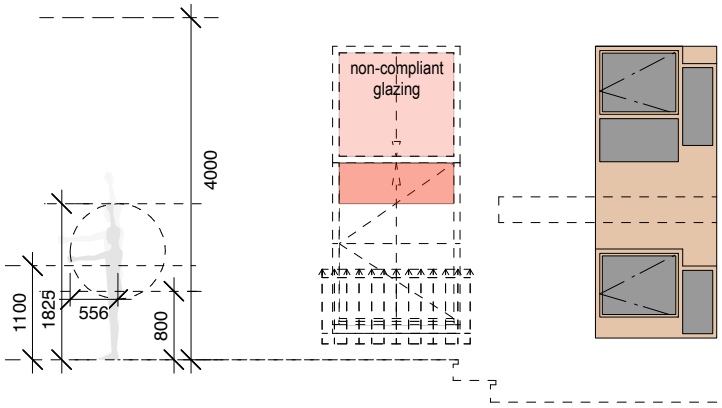
in effect BS8213 formalises this differentiation, makes it a legal requirement; the decision of property developers to comply with the rule, or to build in a factoring agreement, is in effect a means-test as to whether future occupants can and should outsource this particular risk. Intended as a means to draw a line of universal safety – the reach of a small woman's arm – the *non-subjective intent* of the framework is not so much the negation of risk, as its formalization and re-distribution.

Perhaps this is where we can see the 'power of consolidation' offered by this particular code. By outlawing certain kinds of windows and cleaning practices, it stimulates the demand for other kinds of services. The introduction of window cleaning legislation has professionalised this service and created an increased demand for it; it has made work, but also changed the nature of that work. Through a network of standardisers, technical advisors, design consultants, lawyers, and professional, contracted window cleaners, what was previously an aspect of 'shadow labour', has been brought into the 'light'. This rule offers a means to consolidates a number of other concerns – from economic stimuli, and a desire to governmentally formalise working practices – around the theme of risk-mitigation.

But the most instructive aspect of this initial survey was simpler, and more immediately architectural; it offered a way to think of the built object, by way of its standardisation, as a means to facilitate a 'collaboration without consensus'. The brief account of contemporary building designs in Edinburgh offered above has been an initial attempt to decentre our means of thinking about the design process, to demonstrate the range of different problems, and different stakeholders, that seek resolution through building design. The terms of Bowker and Leigh Star are here suggestive of a novel form of architectural critique; through them, we might describe the façade of St Vincent Place as something of a *cumulative mess* trajectory. The need for service contracts, title deed requirements, and owner obligation demonstrate a failure to technically resolve the competing demands of heritage consultants, planners, health and safety regulators, manufacturers, design professionals, service providers, home-owners and tenants. Rather, a residual legal category is needed, one that is not recognised by all parties, and that demands active negotiation, agreement. The initial design problem that prompted this study, then, was the question as to whether *any* window could satisfy those requirements simultaneously, or whether an alternative mode of regulation might be conceived to that end. But more broadly, this initial study suggested a way of thinking about the skill of the designer - be that an architect or a regulator – as one of negotiating the exchange between physical objects and the networks of relationship that they broker.

fig. 2.13.
Proposal for Cleanable Windows in the New Town Conservation Area, (diagram)
Anna Raymond, 2013. Student design project, University of Edinburgh, detail. Supervised by Liam Ross

Diagrams of maximum permissible cleanable area, heritage window opening size, and multi-light opening.



Note on Folio 1

As noted, the above analysis was supported through two by-design analyses. Folio 1.1 presents the diagrammatic analysis of BS8213, and Folio 1.2 the survey of Edinburgh's built fabric. Accompanying them two further design projects extend the research method speculatively. Folio 1.3 documents an installation associated with an exhibition of the author's research, at the RIBA headquarters at 66 Portland Place, and in the British Pavilion at the Venice Biennale. As part of the exhibition design, the author conducted associated research on the exhibition venues, studying both in terms of their compliance and non-compliance with British building standards. The installations comprise a series of interventions designed to bring those buildings into compliance with specific British Standards, and so to exhibit the buildings exemption from them. Folio 1.4 documents a student design project, supervised by the author, which extends this methodology into that of architectural design proper. The specific project concerns the contradictory requirements of BS8213 and Edinburgh's Local Plan. The students work attempts to satisfy the letter of both of these requirements, and so to find ways of resolving these divergent legal requirements in a singular physical object. Seeking to develop a conscious approach from the accidental architecture of the New Town's spandrel panels, the precision and complexity of the constraints are here construed as ways to 'free' the occupant from further legal or economic burdens.

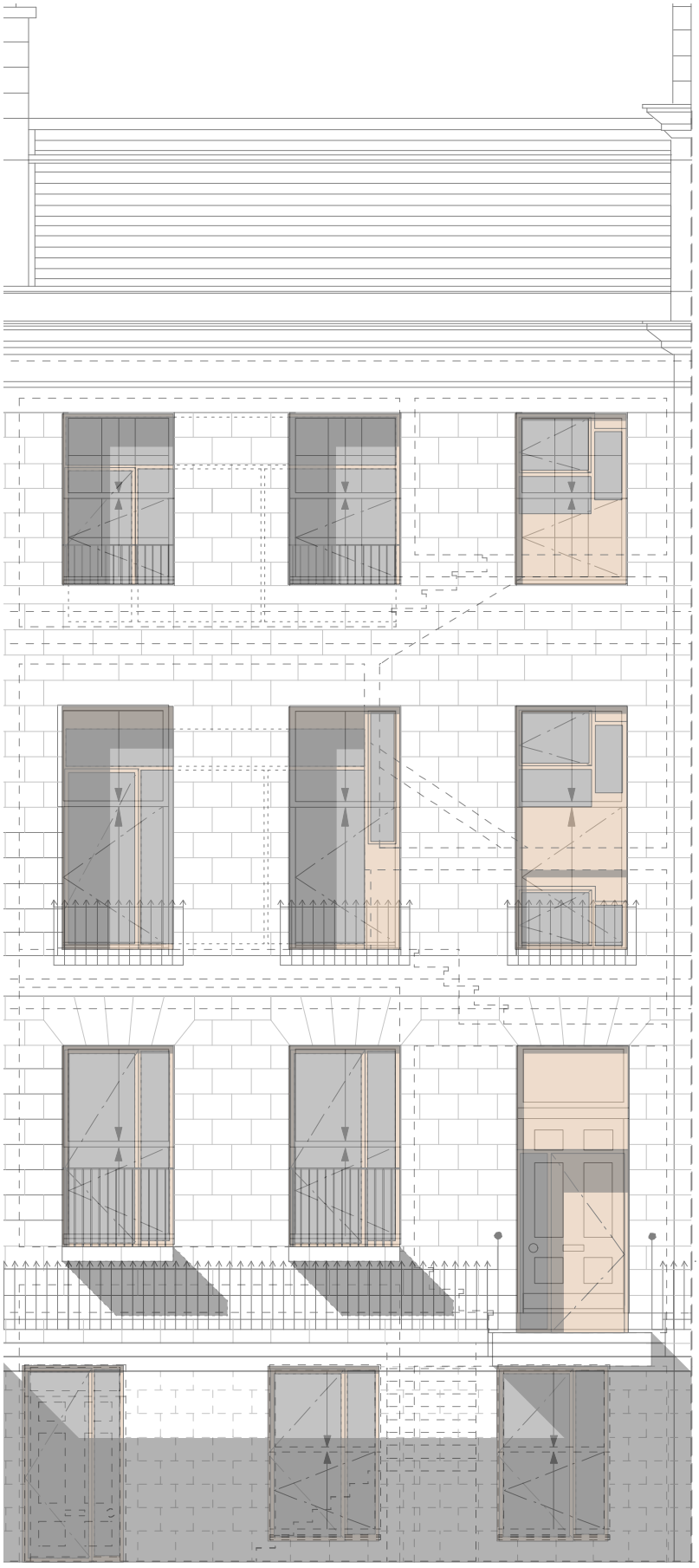


fig. 2.14
Proposal for Cleanable Windows in the New Town Conservation Area
Anna Raymond, 2013.

Proposal for new glazing superimposed on heritage façade. Features including narrow balconies, glazing to be cleaned from floor, multi-light arrays and split levels maximise extent of cleanable area within façade openings of contextual scale.

2.3
Infrastructure Inversion

Reflections on Humour, Irony and Method

Having set out the context, ambitions and methodology of this study, and the context in which they developed, the reader might choose to move directly to the next chapter, which presents the first city case study. The final section of this chapter on context and methods presents something of a digression, one that reflects on a particular aspect of the methodology developed. It is prompted by the recognition that, while the previous study set out with a specific set of questions in mind, what it discovered came as a surprise; the author did not anticipate finding that most of the built fabric of Edinburgh was non-compliant with the particular code studied. That surprise is very much analogous to the one shared by Marianna Valverde, walking around the city of Toronto, discovering that most of it fails to conform to 'comprehensive' zoning ordinances. This final section on context and methods offers a reflection on the nature of such unexpected discoveries. It does so initially by identifying a consistent sense of humour that cuts across the intellectual context introduced. It then goes on to connect this sense of humour to a key methodological concept within the work of Susan Leigh Star, through her notion of 'infrastructural inversion'. Outlining what an infrastructural inversion' of building standardisation might mean, it seeks to define the methodology of the current study.

Laughter and Discovery

Of course, moments of discovery have often been characterized through their relationship to humour. Arthur Koestler, for instance, typifies three kinds of creative discovery; that of the Sage, Artist, and Jester. Drawing on the parallel work of Brian Clegg, he typifies these through the utterances they provoke; 'Ah-Ha!', 'Aaah', and 'Ha-Ha', respectively.[70] Scientific discoveries occur through moments of inspiration, when concepts are created that make sense of things. This moment is accompanied by an energetic 'Ah-Ha!'. Artistic creation elicits the more relaxed 'Aaah'; it is the result of a longed-for congruence between things and ideas, which generates a sense of relief. Laughter, the 'Ha-Ha' of comic discovery, is prompted by surprising, previously unthought juxtapositions; it marks an abrupt change in our pattern of thought. We could use one of

Freud's celebrated *Witz* as an example:

> This lady resembles the Venus of Milo in many respects: she, too, is incredibly old, like her she has no teeth, and there are white patches on the yellowish surface of her body.[71]

For Paolo Virno, reflecting on the relation between innovation and wit, the last of these three categories takes precedence. In *Jokes and Innovative Action: Towards a logic of change,* Virno argues that all human activity is linguistically codified and so operates within grammatical rules.[72] Any form of discovery, then, implies an unexpected application of those rules, interpreting them in a novel way. Such innovation is possible, he tells us, because language is never sufficiently precise or flexible enough to fully determine what a given statement, formula, or representation will mean within a particular context. This is where jokes are instructive and innovative; they draw attention to the constitutive ambiguity in language, the gap between semiotics and semantics (attributing an accidental predicate, such as age, toothlessness, or a white patch, to a grammatical subject, such as the Venus of Milo). According to Virno, while jokes are just games, they are games that demonstrate the transformability of linguistic practices *per se*. They provide the 'diagram' of logical and linguistic techniques through which the human animal is capable of modifying its own 'form-of-life'.

Virno makes this argument through a cross reading of Wittgenstein's *Philosophical Reflections,* and Schmitt's *Political Theology*, suggesting that the linguistic insufficiencies revealed by Jokes are analogous to the political insufficiencies of 'sovereignty'. We encountered this problem of linguistic insufficiency and sovereignty in the previous section; for the architects of Edinburgh's windows, there was no rule that could include within it all those further rules required to ensure its correct application. We likewise noted that this problem forms the basis of Schmitt's 'decisionism'. Law, Schmitt argues, can never be sufficiently precise or flexible enough to determine how it should be interpreted in a particular context. And the interpretation of a rule cannot be guided by another rule; this would imply an infinite regression. Of course, the writing of the law requires a *decision*, and one that cannot - according to Schmitt – be supported by recourse to further supporting laws (there can be no legal support for the decision that 95% is universal, or that squeegees are safe for one population, not for another). But Schmitt also means to say that every *interpretation* likewise entails its momentary suspension; by deciding *which* rule applies to a particular circumstance – the technical standard, the planning guidance – we must temporarily suspend the authority of either. Hence for Schmitt, every application of a rule - no matter how orthodox – implies a situated moment of 'sovereignty'. This general case, however, only becomes visible in moments when the applicability of rules becomes moot, in what he terms the 'state of exception'. It is these moments, Virno argues, that are analogous to the joke; both are situations in which differing interpretations of the rules coincide, such that no legal distinction can be drawn between the legitimate and the illegitimate.

Between rules and regularity

So; how do jurists – or architects and regulators - make a decision in this generalised 'state of exception', where no law can provide us definitive guidance? According to Schmitt (and here he parallels the work of contemporary critical legal theorists)[73] the juristic decision is always a short cut that circumvents the legal framework it operates within, making recourse to a pre-existing, pre-legislative 'regularity':

> Every general norm demands a normal everyday frame of life to which it can be factually applied and which is subject to its regulations. The norm requires a homogenous medium. This effective normal situation is not a mere 'superficial presupposition' that a jurist can ignore; that situation belongs precisely to its immanent validity."[74]

As such, Virno argues, the state of exception is not one of anarchy, indeed quite the opposite; "[t]he suspension of the norm permits the surfacing of the normality of practices, customs, relationships, inclinations, conflicts".[75] In the absence of explicit legal codes, we are thrown back upon the anthropological fullness of the situation we find ourselves in, a fullness that the Law attempts to codify, but never fully succeeds.[76]

So too, in moments of linguistic crisis. The linguistic game of Freud's joke, for instance, is only meaningful to the degree it allows something to surface, in this case, the sexism habitually sublimated through art connoisseurship. If that 'normality' is not recognised, or indeed abhorred, the joke is either not funny, or actively offensive. But there is perhaps something more fundamental revealed by moments of linguistic ambiguity, something that Virno suggests is explored further by the work of Wittgenstein. In Wittgenstein's terms, in the absence of clearly defined codes of behaviour human action falls back upon what he refers to as the "Common Behaviour of Mankind"; the vital, species-specific *regularity* which makes it possible, for instance, for two human animals that do not share a common language to nonetheless communicate. The common behaviour that Wittgenstein describes is not any particular set of social codes, nor animal instinct, nor a particular linguistic structure, but rather our experience of their intersection; what we share in common is the process of attempting to substitute our vital drives - fear, desire, sympathy and antipathy, submission and domination – through linguistically codified behaviour. In the moment of crisis – the joke, the legal decision – what we see is the contingency of this substitution, that our common concerns might be formalized otherwise. We might not agree that 95% is 'universal', or that squeegees are or are not 'safe', but we can still recognise and empathise with a desire to codify and to replace concerns about our own and other people's safety:

> A child has hurt himself and he cries; and then adults talk to him and teach him exclamations, and later, sentences. They teach the child new pain-behaviour. "So you are saying that the word 'pain' really means crying?" – On the contrary: the verbal expression of pain replaces crying and does not describe it. [77]

Humour, Irony and the Law

The joke and the legal decision sometimes coincide directly. For instance, while Socrates is being sentenced to death, we are told, his followers are laughing. What do they find funny about this scene? Gilles Deleuze reflects upon this question in "Humour, Irony and the Law", a section within his treatment of Sacher-Masoch. In its classical conception, Deleuze tells us, law legitimates itself in two related but distinct ways: Law is a representation of absolute Good, of a higher authority that man is won't to forget; at the same time, Law is a means of achieving the Best, it directs human conduct to the most desirable of practical outcomes. These two claims, we can see, might not always be commensurate, nor easy to demonstrate. If a condemned man accepts that legal decision rationally, does it really represent a 'higher' judgement? And if that subject is capable of rationally understanding his crime, and accepting his guilt, is it really for the best that he be killed? We have here another moment of regression, which masks a more simple, violent relationship:

> There is indeed a great deal of irony in the operation that seeks to trace the laws back to an absolute Good as the necessary principle of their foundation. Equally, there is considerable humour in the attempt to reduce laws to a relative Best in order to persuade us that we should obey them. Thus it appears that the notion of law is not self-sufficient unless backed-up by force.[78]

That is, if Virno draws out attention to an *analogy* between the joke and the legal decision, Deleuze points us toward a comic element *within* Law itself, one that has two distinct but related forms. The Law has an ironic dimension – that is, it can sometimes appear deliberately contrary – when it logically undermines its stated rationality. On the other hand, Laws can be humorous – they can seem to engages in whimsical indulgence – when their practical consequences stand in contrast to their stated aims. As dangerous as this may seem, I think we can read here between the death of Socrates, and the technicalities of window cleaning legislation, and so suggest something of a comic dimension to BS8213: it is *ironic* that a standard intended to ensure universal safe cleaning leads to less people cleaning their own windows; it is *humorous* that a heritage window-box blocks the pole-fed hose whose use is mandated to permit a heritage-sized window.

And just as for Virno the state of exception is the norm, so for Deleuze, such moments of humour and irony are not exceptional. Rather, they illustrate fundamental aspects of the workings of law,

and of our relationship to them:

> Irony and Humour are the essential forms through which we apprehend the law. It is in this essential relation to the law that they acquire their function and their significance. Irony is the process of thought through which the law is made to depend upon an infinitely superior Good, just as humour is the attempt to sanction the law by recourse to an infinitely more righteous Best.[79]

It is Kafka, we are told, who understands the full modern significance of humour and irony, exploring our experience of law when bereft of the Good nor the Best. The characters that people Kafka's world know neither what authority Law represents, nor what practical purpose it serves. Exploring our subjective experience as rational subject of Laws – for whom ignorance of legal requirements is no guarantee of innocence - they exist in a "realm of transgression where one is already guilty, and where one oversteps the bounds without knowing what they are". [80]

The stark impossibility of thinking *that*

These broad reflections on discovery, laughter and law can be related more closely to the work of authors discussed in the intellectual context section, and to their own stated research methodologies. Foucault is, of course, no stranger to comedy. *The Order of Things* famously begins with laughter, laughter prompted by Borges, and "a certain Chinese encyclopaedia":

> These ambiguities, redundancies and deficiencies remind us of those which doctor Franz Kuhn attributes to a certain Chinese encyclopaedia entitled 'Celestial Empire of benevolent Knowledge'. In its remote pages it is written that the animals are divided into: (a) belonging to the emperor, (b) embalmed, (c) tame, (d) sucking pigs, (e) sirens, (f) fabulous, (g) stray dogs, (h) included in the present classification, (i) frenzied, (j) innumerable, (k) drawn with a very fine camel-hair brush, (l) et cetera, (m) having just broken the water pitcher, (n) that from a long way off look like flies.[81]

What Foucault sees in this encyclopaedia is what Koestler and Clegg see in the discovery of the Jester: "In the wonderment of this taxonomy, the thing we apprehend in one great leap, the thing that, by means of the fable, is demonstrated as the exotic charm of another system of thought, is the limitation of our own, the stark impossibility of thinking *that*." And this discovery is closely related to the problems addressed by Virno, Wittgenstein and Schmitt. Borges is attempting to describe the comic dimension of John Wilkins' 'analytic language', his attempt to construct a more perfect congruence between ideas and things through a lexicon that would logically organize all that was knowable. What we see in one great leap through this exotic encyclopaedia is, according to Foucault, the contingency and mutability of Wilkins' language, and likewise our own. Wilkins attempts to construct a higher order of logic through linguistic rules

collapses – as he attempts to find transcendent categories through which to organise stones - when it can't be brought into relation with the illogical profusion of things. This revelation - the contingent basis of both Kuhn's and Wilkins' categories – produces moments of irony and humour. Foucault uses this comic episode to preface his own methodological statement, because it cuts directly to his object of study; the 'Chinese Encyclopaedia' points us neither to higher truths, nor to things themselves, but rather to the *positivity* of our own modes of ordering. I suggest that – in tracking the attempt to interpolate 'safety' within the dimension of specific windows and populations – governmentality is likewise faced with, and struggles over, the complex profusion of everyday practices.

Computer Says "No"

Foucault laughing with Borges likewise prompts the laughter of Geoffrey Bowker and Susan Leigh Star. In *Sorting Things Out*, they preface their own work with a joke, explicitly citing their debt to *The Order of Things*.[82] And in setting out their research methodology they draw upon a sense of humour that will strike us as familiar. The challenge of conducting research on standards is, according to these authors, that it is so *normal*. What the categorical logics of meta-data standards, and the legal requirements of fire-safety codes have in common is that they are embedded, transparent, invisible. Unlike the categories of the 'Celestial Emporium', they do not leap out of the page as contradictory, partial, contingent. The principal methodological challenge they identify, when studying standardisation, is that of countering this naturalization. How do we understand the fable behind the magic of standards? Bowker and Star name their method for doing this Infrastructural Inversion.

The premise is as follows: in certain circumstances, infrastructures make *themselves* visible. Through a kind of gestalt switch, systems that are usually part of a naturalized ground suddenly stand out into sharp relief. Bowker and Star use the "computer says 'No'" moment in the BBC comedy *Little Britain* as an example; in the process of completing an application via computer, this apparently transparent, facilitating technology reveals itself as a stand-in with its own agency. Moments of inversion often occur when Infrastructures break. Heidegger's famous 'broken hammer' is an example of this; our non-reflexive use of a tool is interrupted when it breaks. In that moment its materiality - fragments of wood and metal - suddenly stand out as obtrusively 'present'.[83] We can think of other comic examples; the leaky faucets and ill-fitting boots that make up Grandville's *Petites Misères de la vie Humaine*, or the homeless bobbin *Odradek* that laughs at Kafka's family man, offer other moments in which everyday object objects appear to assume a kind of uncanny agency.[84] But Infrastructures also become visible while continuing to work. Bowker and Leigh Star cite Howard Becker's sociology of art as rich in examples. Becker recounts, for instance, the challenges of staging an eight-hour concert performance, which required the producers to become embroiled in the practicalities of negotiating

fig. 2.15
Le Petites Miseres de la Via Humaine
Jean-Jacques Grandville, 1843.

In this scene, the shortness of a chivarlrous man is exacerbated by the regular length of umbrella handles. The buses and taxi's seem to be against him, too (Caption: "I didn't dare hope for a bus, and as soon as it rains, the cab's disappear as if by magic")

varied working hours for unionized labourers, thus revealing the ordinary indebtedness of artistic forms to complex networks of social agreement.

Ticklish Nose

Leigh Star offers a series of her own examples in *This is Not a Boundary Object*. In this paper, she recounts the development of her own research practice through a series of often humorous anomalies - each a moment of infrastructure inversion - that prompted changes in her thinking.[85] Having been served David Ferrier's notebooks on a silver platter, in the lushly carpeted archives of the Royal College of Physician's, she finds the pages covered in scrawled handwriting, marked by the bloody finger-prints of an ape, upon whose brain Ferrier has induced a lesion; she is prompted to reflect on science's dependence on non-human actants, and the work it goes to in obscuring that dependence. Reading between Ferrier's notebooks and his published reports, she finds the margin-notes written by caretakers of epileptics, but not included in the official findings; she is prompted to reflect on the folk-knowledge that medical science depends upon, but silences. Leafing through the archives of the Museum of Vertebrate Zoology, a dead bird falls out of a manila folder, accompanied by a hand-written note from a birder; she is prompted to study how the Museums categorical systems are shaped by the practical requirements of working with amateurs and hired-hand researchers.

Such moments are of methodological significance for Leigh Star. In her lectures and papers, she uses them as object lessons for her own students. She asks them to look "for things that strike them as strange, weird, and anomalous… [and asks] What is causing them doubt? How may it become enquiry?"[86] She describes the need to cultivate a nose that is tickled by anomalies within categorical systems, by discrepancies between what people say and do, an interest in the counter-intuitive and often humorous struggles between actors and the constraints and conventions they work within.

Inversion as Method

The methodological cues offered by Bowker and Leigh Star's work, recounted in section 2.1, were all prompts to assist us in recognising moments of 'infrastructural inversion'. They taught us to look out for moments in which the contingency of our standards suddenly stands out, makes itself visible, as it comes to be applied, translated into physical form. If Bowker and Leigh Star note that such moments are often humorous, the purpose of the above review has been to say more precisely why this is the case: Moments of infrastructure inversion are moments in which technically mediated governmental initiatives suddenly snap into focus, either because they contradict their original intent, or lead to unintended consequences. It is through this concept of infrastructure inversion that the current study defines its own methodology. The modes of research conducted and presented within this dissertation are conceived as

means to follow the set of cues offered by Bowker and Leigh Star. Repurposing those cues toward a study of *building* standardisation, they could be re-stated in terms of the following broad question sets:

The Messiness of Order: Building standards are rational documents. However, as they intersect with other shaping concerns in the built environment, they become enmeshed with other rationalities, sometimes to surprising and contradictory effect. What are the 'mess-trajectories' of building standards? What new governmental problems do they produce, and what new governmental actions do they legitimise? Is this process of reflexive governmentalisation a vicious or virtuous cycle, one which capacitates or de-capacitates?

The Materiality of Law: Building standards are not *only* rational; they are always mediated by text, by drawings, by buildings. How is the effect of a governmental programme shaped by the material character of its mediation? Does the texture of this media create specific pockets of agency for those who work closely with it, allowing legislators, architects, or builder to warp its effects?

Re-coding Norms: Programmes of standardization, and programme of urban renewal, are rarely built from scratch; they adapt and build upon existing physical and legal infrastructures. How do contemporary governmental standards re-construe the infrastructures that they build upon? What conflicts and congruences emerge between the differing govern-mentalities embedded within generations of buildings and building legislation? How do architects and legislators exploit this multivocality evident within Law, and the City, in order to innovate?

Exceptional Standards: We might presume that building standards lead to a greater consistency of practices and forms in the construction of the built environment. But they also create 'others', the residual categories of practices that they outlaw. What happens to those practices? Are they transformed, or do they continue to be permitted, tacitly or explicitly? What is the field of difference constructed between such legitimate and illegitimate practices, how is it calibrated, and to what effect?

While all of these questions are important for each of the case studies presented here, it is possible to suggest that each city-study was prompted by a particular set of these questions. In the preceding section I explored the *residual categories* constructed by an article of health and safety regulation in Edinburgh, and the way these shape its practical effects. In Parts 3 and 6, which study the cities of Edinburgh and London, I focus particularly on the *texture* of fire-safety codes, the way that they create specific opportunities for those who work closely with them. In Part 4, which studies Lagos, I outline a *mess-trajectory* constructed by urban fire-safety legislation, and the

practical politics of its application. In Part 5, which studies Tokyo, I consider the kinds of *historical imagination* that are invoked by programmes of fire-safety legislation in that city. As such, the whole of this dissertation might be framed as an attempt to work-through, in the field of architectural theory, the methodological prompts offered by this emerging field of research.

It is worth noting in advance some of the limits of this methodology. As others have pointed out, the technique of infrastructure inversion is itself politically ambivalent; it is as useful for climate change denialists seeking to discredit climate science and delay governmental action, as it is for sociologists concerned with the hegemonic effect of techno-science.[87] That is, like Foucault's genealogical method, this approach might be seen to only reveal contingent historical impurities within broader processes of scientific and governmental rationalisation. But it is precisely by doing so, I want to suggest, that we see the shaping effect of the *built* for Governmentality. In highlighting moments where building standards fail, this dissertation does not attempt to offer an assessment of the effectiveness of standardisation per se. What it offers is, by design, a series of episodic and ironic sketches, charting the processes through which governmental authority becomes enmeshed within the problems and opportunities of building design. What we can generalise from these sketches is the way that buildings act, both in prompting and translating govern-mentalities. The forthcoming case studies are therefore presented as didactic lessons on the mutability and contingency of contemporary norms, but also as rich and instructive descriptions of the opportunities and stakes of thinking things otherwise.

Inversion by Design

Design – in the sense of *drawing* – is here used as an important means to 'invert', to make visible, the infrastructures of building standardisation. In section 2.2, for instance, it was through a series of drawn analytic *diagrams* that the spatial and technical implications of BS8213 were studied (fig. 2.8), implications which were not themselves elaborated or presented within the regulatory documents themselves. Likewise, it was through a series of drawn *surveys* that the non-compliance of Edinburgh's built fabric was revealed (fig's. 2.9-13), a non-compliance that could not be demonstrated by other means. That is, drawing is here used a a research method, a means of 'figuring' standardisation. These drawn surveys and diagrams are therefore not presented simply as illustrations, means of graphically representing what is already known. Rather, the suggestion is that it is in the process of translating textual specifications, via drawings, into built forms, that the process of regulation opens itself to other concerns, coming to be interpreted in different way. As such, the diagrams and surveys conducted here are attempts to return to that moment of translation, to train the author in detecting the architectural consequences of particular regulations, and to prompt reflection on how they might be reconceived in terms of other concerns.

We could note some in advance some limits of this particular research method, also. The diagrams and surveys conducted in this research project are ones which have employed conventional architectural forms of representations; two-dimensional drawings in orthographic projection. This form of analysis brings its own limits of 'visibility'; it can only be used to study regulatory requirements that are expressible through *dimensional* standards. It would not be possible, for instance, to conduct this form of by-design analysis for a standard specifying non-spatial requirement (such as a U-Value), or indeed specifying an abstract 'functional requirement'. The method of by-design analysis used here has therefore limited this study to regulatory requirements which have textually expressible spatial consequences.

Diagrams, Surveys, Proposals

In the early stages of research the author experimented with another mode of by-design research, that of the speculative design proposals. An example of this was likewise presented in section 2.2 (fig. 2.14). Here, a design proposal was made that, in complying exactly with a specific technical standard, functioned analogously to the analytic diagrams and surveys above; it drew attention to a tense relation between those standards and a set of other concerns, here historic conservation. Similar by-design analyses have been explored in relation to research material presented in Chapters 3, 5 and 6, also. These design *proposals* were ultimately not seen to advance the research enquiry. While the diagrams and surveys discussed above were found to be a useful means to study the effect of regulatory measures, the extension of this methodology into speculative design – and so to construing hypothetical circumstances of application - drew attention away from their effects in practice.

While not informing the research findings, these design proposals were nonetheless an important aspect of the educational arc presented here. In order to documented that arc fully, an Appendix is provided that contains a representation of all the by-design research conducted as part of this project. Within that appendix, the research material is organised through the three terms outlined above; it is catalogued through groups of *diagrams*, *surveys*, and *proposals*. Not all of this work is drawn upon by the dissertation; again, in general the diagrams and surveys were found to be the more productive mode of enquiry.[88] Where this by-design material is drawn upon as part of the thesis it is reproduced and discussed within the body of the dissertation. The Appendix is therefore provided for reference and context, not as part of the thesis argument itself.

Some of the by-design material documented in the Appendix, and referenced within the dissertation, was completed by students supervised by the author, in the context of his work as a design-studio tutor. The pedagogic value of student engagement in this work is reflected upon by the author elsewhere[89], but is not construed as

an aspect of this research project. As above, speculative proposals completed by students as part of these design-studio projects are not here drawn upon in support of the thesis, but are nonetheless documented for context. In some cases, though, student diagrams and surveys - completed as part of their own research for studio projects – were informative to this research project. Where that is the case, they are reproduced within the dissertation, and credited as the work of others. In the course of completing these projects, students under the supervision of the author also sometime brought technical or historical material to the attention of the author, and so contributed to this research project in another way. Again, in these cases personal correspondence with the relevant student is cited, with thanks.

Travelling with Standards

As demonstrated in section 2.2, the focus of this project was not initially bracketed by the problem of fire-safety. However, in the course of initial studies in the student's home city of Edinburgh, fire-safety regulations suggested themselves for a series of related reasons. Firstly, fire-safety standards were identified as having a significant spatial effect on the design of the built environment, one which was expressed through dimensional standards. The problem of fire was therefore amenable to the form of by-design analysis outlined above. Secondly - as will be discussed in detail in the next chapter – the dimensional standards of fire-safety regulation were seen to have a close relationship with the physical fabric of the city of Edinburgh, often developing in response to fires in that city. This close historical congruence between fire-safety and Edinburgh informed the focus on cities as formative of particular governmental frameworks. Finally, that close congruence between Edinburgh and fire also gave the author access to expertise which would not have been available in relation to other topics. The centrality of Edinburgh to the UK's fire-safety culture continues in the form of the University of Edinburgh's leading role in fire-safety science, its hosting of the BRE's fire-safety centre, and its close relationship with Arup Associates, all discussed in detail in Chapter 6. Likewise there exists within the University of Edinburgh strong institutional links between the BRE, at the school of Engineering, and the Institute for the Study of Science, Technology and Innovation. Being situated within the University of Edinburgh, the author therefore had access to key actors within this regulatory field, and to sociologists engaging with their concerns. That is, the choice of fire as a topic, of the city as an analytical device, and STS as an intellectual frame, were all 'grounded' within Edinburgh as an initial object of study.

The selection of London as a case study city suggested itself on the basis of relationships first understood in Edinburgh. In dialogue with colleagues at the University, and with Arup associates, it became clear that the City of London was today a kind of laboratory for regulatory reform in the field of fire-safety. This suggested a comparative study between the two cities. The extension of this

comparative method to other cities depended on more contingent factors. In the case of Lagos, this opportunity came in the form of British Council commission to study cultural exchange within the British Commonwealth. This was construed as an opportunity to study the export of British Standards as an aspect of the colonial, and post-colonial experience. Professional contacts within Lagos suggested that particular city, within which fire again proved to be an important aspect of urban history and regulation. In the case of Tokyo, the opportunity was an existing memorandum of agreement with a Japanese university that supported my engaging in teaching and research exchanges with academics in that country. Preparatory research revealed the particularity of fire within the history of Edo-Tokyo, suggesting that city as a case.

The selection of case-study cities was therefore not based upon a systematic logic,[90] and the four chapters presented here do not seek to offer a comprehensive survey. [91] There are nonetheless particular observations that this set of cases, and their mode of selection, afford. While the problem of fire is not 'universal', one thing that this episodic study demonstrates is the degree to which it is a widespread and commonly experienced problem, that often has a profound shaping effect on urban form and its governance. The comparison of different cities, at different moments in time, likewise allowed the study to reflect on the way this common problem has been shaped by historical and geographical specificities, not least the particular material character of the case-study cities themselves. Finally – alongside that concern for local specificity - these particular four cities have allowed the author to study the way that fire-safety regulations *move*. As will be seen, while Edinburgh offered an example of a legal framework developed in close congruence with a particular urban fabric, it also prompted a study of the way that framework travels in both space and time, coming to be interpreted in novel contexts. Lagos offered a means to study that same phenomenon from a different perspective; that case study considers the way that *imported* regulations come to be appropriated within and by new circumstances. These same questions are also at stake in the Tokyo case study, but here they have a different complexion; whether fire-safety codes are or are not 'Japanese' is shown to be an important issue for this city as it wrestles with an isolated history and a globalised present. Finally, studying the way Arup Associates apply studies of the World Trade Centre fire to new office in London, we engage in a situation that is simultaneously local and global.

(Endnotes)

1 Michel Foucault, *Power/Knowledge: Selected Interviews and Other Writings, 1972-1977*, ed. Colin Gordon, 1st American Ed edition (New York: Vintage, 1980): 121.

2 Michel Foucault and Robert Hurley, *The History of Sexuality, Vol. 1: An Introduction*, Fifth or Later Edition (Vintage, 1990): 88.

3 Foucault outlines this object of study in 'What is Enlightenment', in Michel Foucault, *The Foucault Reader: An Introduction to Foucault's Thought*, ed. Paul Rabinow, New edition (London: Penguin, 1991): 38.

4 Foucault outlines his own research methodology in 'The Archaeology of Knowledge'. Chapter 3 introduces the concept of 'discursive formation'. His contention is that the 'objects' of discourse – madness, sexuality, criminality – do not precede their discussion, but are rather formed through the 'rules', or the conceptual possibilities, through which we think about them. See Part 2 of Michel Foucault, *The Archaeology of Knowledge* (Routledge, 2002).

5 For an outline of the Genealogical method, see "Nietzsche, Genealogy, History", in Michel Foucault, *Language, Counter-Memory, Practice: Selected Essays and Interviews*, New Ed edition (Ithaca, NY: Cornell University Press, 1980).

6 Foucault, *The Foucault Reader:* 38.

7 Foucault: 38.

8 Foucault: 45.

9 Michel Foucault, *The Birth of Biopolitics: Lectures at the Collège de France, 1978-1979: Lectures at the College De France, 1978-1979*, trans. Mr Graham Burchell (New York: Palgrave Macmillan, 2010).

10 I'm quoting here Foucault's paraphrasing of Wilhelm Ropke, from the *Gruntexte zur Sozialen Markitwirtshaft*, 1950. Ropke is not here outlining the theme-programme of Liberalism per se, but his own specific project in establishing a 'social market society' in post-war Germany. Here question of free-trade and economic planning are explicitly seen as means to displace economic protectionism and national socialism. What Ropke calls for specifically is "decentralisation in the widest and most comprehensive sense of the word; to the restoration of property; to a shifting of the social centre of gravity from above downwards; to the organic building-up of society from natural and neighbourly communities in a dosed gradation starting with the family through parish and county to the nation; to a corrective for exaggerations in organisation, in specialisation, and in division of labour ... ; to the bringing bade of all dimensions and proportions from the colossal to the humanly reasonable; to the development of fresh non-proletarian types of industry, that is to say to forms of industry suitable to peasants and craftsmen; to the natural furtherance of smaller units of factories and undertakings ... ; to the breaking-up of monopolies of every kind and to the struggle against concentrations of businesses and undertakings, where and whenever possible; ... to a properly directed country-planning having as its aim a decentralisation of residence and production." Within this ambition, Foucault identifies the basis of a 'Vitalpolitic' or 'Biopolitics', in which questions of Sovereign right are fully displaced by those of

household management. I it is this sense, then, that I use the phrase as a short-hand for the liberal critique in general, as Foucault describes it. See Foucault: 148, 157.

11 Mitchell Dean, *Governmentality: Power and Rule in Modern Society* (SAGE, 2009); 18-19.

12 Terminological note: For purposes of clarity in this text I chose to disambiguate between these two meanings of the word. When speaking of the diverse means of conducting conduct we employ and experience in our daily lives, I use the term 'govern-mentality' or 'govern-metalities' (hyphenated). When speaking of the ambition of state authorities, in contemporary liberal democracy, to operate on and through the self-governing capacity of the population, I use governmentality (non-hyphenated).

13 For Dean's definition of the highlighted terms, see the section 'Analysing Regimes of Governance" in Dean, *Governmentality*.

14 Dean: 41-43.

15 Dean: 22.

16 Dean: 157-158.

17 Mariana Valverde, 'Seeing Like a City: The Dialectic of Modern and Premodern Ways of Seeing in Urban Governance', *Law & Society Review* 45, no. 2 (1 June 2011): 277–312, https://doi.org/10.1111/j.1540-5893.2011.00441.x.

18 Mariana Valverde, *Everyday Law on the Street* (University Of Chicago Press), accessed 11 August 2015, https://www.dawsonera.com/abstract/9780226921914.

19 Dean, *Governmentality*: *220, 227*.

20 Within this dissertation I draw on scholars associated with both fields. Bachelard, Bloor and Leigh Star are associated with the Sociology of Scientific Knowledge, where Callon, Latour and Law are associated with Science and Technology Studies. While these two fields can be distinguished in terms of the specific weighting they give to sociological factors within scientific knowledge, this distinction is not thematised as of significance here.

21 Latour has suggested that Science & Technology Studies depends upon the work of the 'Edinburgh School'. See Latour, "'For David Bloor and beyond: Reply to Bloor's Anti-Latour"', *Studies in History and Philosophy of Science* 30, no. 1 (1999), http://df7sm3xp4s.search.serialssolutions.com/?V=1.0&N=100&L=DF7SM3XP4S&S=AC_T_M&C=Studies in history and philosophy of science.

22 The 'Strong Programme' can be read as an oblique contribution to the famous 'Foucault-Habermas' debate. The Habermasian critique of Foucault is that his genealogical method simply traces contingent historical impurities within a meta-history of emancipation; this view might be seen to parallel that of early social studies in science, which concerned itself with failed science, demonstrating how sociological factors had contributed to errors within research (such as researcher bias etc.). By contrast, the Edinburgh School sought to develop a 'stong' programme – through scholars such as David Bloor and Donald Mackenzie - arguing that such bias exists equally within successful science, framing, for instance, the ob-

jects of enquiry, and resource allocation. See Donald MacKenzie, 'Notes on the Science and Social Relations Debate', *Capital & Class* 5, no. 2 (1 July 1981): 47–60, https://doi.org/10.1177/030981688101400103.

23 Latour set out his methodological dictum that science and technology must be studied "in action", in chapter one of *Science in Action*. Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society*, New Ed edition (Cambridge, Mass: Harvard University Press, 1988).

24 I take this description of scientific collaboration from Griesemer and Star (1989), but the term 'collaboration without consensus' is now in broader circulation, as in Flyverbom (2011). Susan Leigh Star and James R. Griesemer, 'Institutional Ecology, `Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39', *Social Studies of Science* 19, no. 3 (1 August 1989): 387–420, https://doi.org/10.1177/030631289019003001; Mikkel Flyverbom, *The Power of Networks: Organizing the Global Politics of the Internet* (Edward Elgar Publishing, 2011).

25 John Law, *A Sociology of Monsters: Essays on Power, Technology, and Domination* (Routledge, 1991). Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (OUP Oxford, 2005).

26 I am here casting forward to an argument that will be made explicitly with reference to the work of Vaughan Higgins. See Vaughan Higgins, Simon Kitto, and Wendy Larner, *Calculating the Social: Standards and the Reconfiguration of Governing* (Palgrave Macmillan, 2010).

27 The comedian W.C. Fields is credited with the TV aphorism: "Never work with Children or Animals".

28 See Bruno Latour, *Visualisation and Cognition: Drawing Things Together*, in Elizabeth Long and Henrika Kuklick, *Knowledge and Society: Studies in the Sociology of Culture Past and Present : A Research Annual / 1986* (Elsevier Science Limited, 1986):4-7.

29 See Bruno Latour, *Visualisation and Cognition: Drawing Things Together*, in Long and Kuklick: 4-7.

30 Latour in Long and Kuklick: 7-8.

31 Susan Leigh-Star uses these standards as an example of a 'Boundary Object', a term we will touch upon later, referencing the work of Turnbull, himself a sociologist of scientific knowledge. See Geoffrey C. Bowker and Susan Leigh Star, *Sorting Things out : Classification and Its Consequences / Geoffrey C. Bowker, Susan Leigh Star*, Inside Technology (Cambridge, Mass. ; London : MIT Press, [1999], ©1999., 1999).

32 This role is perhaps most explicitly stated within Latour's concept of the 'parliament of things'. In the post-script to this dissertation we will return to this topic explicitly, when considering the way that objects might 'judge'. Bruno Latour and Catherine Porter, *We Have Never Been Modern* (Harvard University Press, 1993). pp. 142-145

33 Latour, *Reassembling the Social*.

34 Bruno Latour, 'Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern', *Critical Inquiry* 30, no. 2 (1 January 2004): 225–48, https://doi.org/10.1086/421123.

35 Latour: 236.

36 Slota and Bowker make this argument in their essay "How Infrastructure Matters", in Ulrike Felt et al., *The Handbook of Science and Technology Studies* (MIT Press, 2016): 532.

37 Thomas Parke Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (JHU Press, 1993).

38 Paul N. Edwards et al., 'Introduction: An Agenda for Infrastructure Studies', *Journal of the Association for Information Systems* 10, no. 5 (May 2009): 364–74.

39 I am taking this definition from Edwards et al.

40 Bowker and Star, *Sorting Things Out*.

41 Martha Lampland and Susan Leigh Star, Standards and Their Stories: How Quantifying, Classifying, and Formalizing Practices Shape Everyday Life / Edited by Martha Lampland and Susan Leigh Star, Cornell Paperbacks (Ithaca : Cornell University Press, 2009., 2009).

42 Higgins, Kitto, and Larner, *Calculating the Social*.

43 Lawrence Busch, Standards : Recipes for Reality / Lawrence Busch, Science, Technology and Society (Cambridge, Mass. ; London : MIT Press, ©2011., 2011).

44 James C. Scott's book 'Seeing Like a City' studies this optical disposition. The subject of his book is the way that States tend to focus on the big picture, the headline story, and miss the detail, the realization. This leads to the failure of their *Grand Projet*. However, the implication of Valverde and Magnusson's concept of 'Seeing Like a City' is that Scott himself could be accused of a similar optic disposition. Taking the big story as read, we necessarily see a big failure. If that story is itself seen as an inadequate representation of messy and conflicting goals, its results likewise appear differently. See James C. Scott, *Seeing like a State : How Certain Schemes to Improve the Human Condition Have Failed*. (New Haven, Conn. ; London : Yale University Press, [1998], ©1998., 1998). Warren Magnusson, 'Seeing Like a State, Seeing Like a City' (Annual Meeting of the Canadian Political Science Association, Vancouver, 2008), http://www.cpsa-acsp.ca/papers-2008/Magnusson.pdf.

45 Higgins, Kitto, and Larner, *Calculating the Social: 5*.

46 A parallel example might be offered from the field of organisation studies. In Randy Hodgson's Kafka-esque analysis of bureaucracy he suggests that Weber's critique – in which rule-adherence becomes an end in itself, diverting attention from substantive goals – only understanding one organisation level of 'visibility'. A kafkaesque understading, he suggests, would highlight the way that individual agents within organisations bend rules to their own concerns. See Randy Hodson et al., 'Rules Don't Apply: Kafka's Insights on Bureaucracy', *Organization* 20, no. 2 (1 March 2013): 256–78, https://doi.org/10.1177/1350508412443581.

47 Star and Griesemer, 'Institutional Ecology, `Translations' and Boundary Objects'.

48 Star offers defines and then reflects upon this concept in two related

papers; S. Leigh Star, 'This Is Not a Boundary Object: Reflections on the Origin of a Concept', *Science, Technology & Human Values* 35, no. 5 (1 September 2010): 601–17, https://doi.org/10.1177/0162243910377624; Susan Leigh Star, 'The Structure of Ill-Structured Solutions: Boundary Objects and Heterogeneous Distributed Problem Solving', *Distributed Artificial Intelligence* 2 (1989): 37–54.

49 "The opportunity of creating an 'accent' building on the site adds to the richness of Waterfront Avenue… The built form of (the neighbouring building) is largely a horizontal block, hard against the heel of the pavement… The scale of the façade of (this building) with its straight-lined architectural design needs a foil to avoid the street becoming repetitive". Waterfront Edinburgh Leisure, 'Granton Waterfront Madelvic Plot 8 Design Statement 05_01543_FUL-Design_Statement-249696(1)' (City of Edinburgh Council Planning Department, 5 May 2005): 9.

50 In this phrase I'm paraphrasing here Prozorov's reading of Schmidt and Agamben. "The paradox of sovereignty is thus the uncanny *identity of the foundational and the transgressive"* Linking Schmidt's definition of Sovereignty to Agamben's definition of 'potentiality', he suggests that "as a foundational transgression that remains inscribed in the existence of the diagram as its constitutive outside, sovereignty is nothing other than the potentiality for order not to be, its being capable of its own impotentiality". See Sergei Prozorov, *Foucault, Freedom and Sovereignty* (Routledge, 2016): 86.

51 As we will see in the following section, the structural necessity of 'sovereignty', in Schmitt's account, does not confer an absolute authority upon a specific subject position; rather, it points us beyond law, to the 'everyday frame of life' that provides Law with its 'immanent validity'. See Carl Schmitt and Tracy B. Strong, *Political Theology: Four Chapters on the Concept of Sovereignty*, ed. George Schwab, University of Chicago Press Ed edition (Chicago: University of Chicago Press, 2006).

52 See 22 Peter Frankling, "Construction Regulations in Scotland", in Anthony Speaight, *Architect's Legal Handbook* (Routledge, 2012): 269-282.

53 Victorian governmental and philanthropic action intended to improve the living conditions of the working classes often cited a concern over the prevalence of incest amongst families living in single-room dwellings. One of the earliest forms of housing regulation was the need for dwellings to have a minimum of two-rooms, such that the sexes could be separated at night. I cannot offer a published citation in support of this argument, which was offered to me through personal correspondence with a student under my supervision. My thanks to Richard Collins, University of Edinburgh MA Architecture programme 2012.

54 Scottish Government, 'Building (Scotland) Act 2003', Text, accessed 24 October 2017, https://www.legislation.gov.uk/asp/2003/8/contents.

55 An example of such a competing agenda in today's buildings standards might be that of fire-safety and universal access. The latter has made wheelchair access more widespread in our built environment, but in doing so has caused problems in terms of the egress of the wheelchair-bound, when lifts revert to serving an access means for fire-fighters. The uncomfortable attempt to resolve this competition of concerns in our current standards is the requirement for wheelchair waiting spaces within egress stairs.

56 Part 1, Clause 1a-c, Scottish Government.

57 Scottish Government, 'Technical Guidance', Website Section, 2 March 2009, http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/pubtech.

58 The specific terminology used with Scottish Building Standards appears to originate from *IEC 61508*, a standard published by the International Electrotechnical Commission, titled 'Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems (E/E/PE, or E/E/PES)'. This defines the term 'functional safety', adopted elsewhere, as "Freedom from unacceptable risk of physical injury or of damage to the health of people, either directly, or indirectly as a result of damage to property or to the environment." I note this as another example of how specific practical issues – here the danger posed by electrical equipment – become the means through which abstract concepts such as 'safety' are defined. See 'IEC Functional Safety and IEC 61508', accessed 24 August 2018, http://www.iec.ch/functionalsafety/.

59 Scottish Government, 'Technical Handbook 2013 - Domestic - HTML Complete', Website Section, 10 June 2013, http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/pubtech/th2013domcomp.

60 Scottish Government: Clause 4.8.3 .

61 'BS 8213-1:2004 - Windows Doors and Rooflights. Design for Safety in Use and during Cleaning of Windows, Including Door-Height Windows and Roof Windows. Code of Practice – BSI British Standards', accessed 14 July 2017, https://shop.bsigroup.com/ProductDetail/?pid=000000000019976198.

62 Stuart Smith, Beverley Norris, and Laura Peebles, Older Adultdata: The Handbook of Measurements and Capabilities in the Older Adult : Data for Design Safety (London: DTI, 2000).

63 'BS 8213-1:2004 - Windows Doors and Rooflights. Design for Safety in Use and during Cleaning of Windows, Including Door-Height Windows and Roof Windows. Code of Practice – BSI British Standards': 11.

64 Michel Foucault, *The Birth of Biopolitics: Lectures at the Collège de France, 1978-1979: Lectures at the College De France, 1978-1979*, trans. Mr Graham Burchell (New York: Palgrave Macmillan, 2010).p. 63

65 The notion of a 'negative liberty', and its importance for liberal philosophy, is perhaps best defined in Isaiah Berlin, *Four Essays on Liberty*, First Edition (Oxford: Oxford Paperbacks, 1969); Foucault, *The Birth of Biopolitics*: 64.

66 The author does have some concerns as to whether this limit is in fact judicious. The Office for National Statistics, mortality and life event data contains a section W13: listing death due to 'Fall from, out of or through building or structure'. Between 2001 and 2011 there were 48 deaths in this category for women. 41 involved a fall from a window, and two noted that they had been cleaning a window at this time. In personal correspondence with the ONS they note, however, that the cleaning of windows was not cited as the *cause* of death, as both events occurred within hospitals or care-homes settings, and dementia was cited as the cause of death. Therefore, the sense that there is a statistically significant number of deaths due to the over-reaching of particularly small women seems, to this author, unsupported. Likewise, on the basis of the particular deaths noted here,

the goal of self-sufficiency appears misplaced. That is – while it is not the ambition of this research – it seems to me that it would be reasonable to question whether the effects of this particular governmental standard are justified by its rationale, or its relation to matters of fact. Personal Correspondence, Kat Pegler and Liam Ross, 'Mortality Data Enquiry', 18 September 2012.

67 See Edinburgh City Local Plan, Chapter 4: Caring for the Environment, Policy Env 6a: Conservation Areas – Development, in The City of Edinburgh Council, 'Edinburgh City Local Plan | The City of Edinburgh Council', accessed 24 October 2017, http://www.edinburgh.gov.uk/downloads/file/849/eclp_chap_4-6. P. 37

68 This was particularly evident during the recession of 2008, in which many new buildings stood unsold and unoccupied for long periods, the only inhabitants peopling new high-value buildings were professional window-cleaners, servicing contracts yet to be sold on. Including detailed method statements, and typically calling for specialist technologies to clean high-level external glazed surfaces from the ground, these contracts can also place significant burdens upon the occupier, necessitating their presence at home for regular visits to clean internal faces.

69 Refer to transcript of interview, included in the appendix, Folio 8.

70 Arthur Koestler, *The Act of Creation* (MacMillan Publishing Company, 1970): 27. My thanks to Dorian Wiszniewski for drawing my attention to this source.

71 Freud, *Jokes and Their Relation to the Unconscious*, quoted in Virno, "Multitude, Between Innovation and Negation", 136.

72 Paolo Virno, *Multitude: Between Innovation and Negation* (Semiotext(e), 2008).

73 On of the fundamental of 'critical legal theory' is the argument that jurists cannot step outside of their own moral frame in the way that they interpret law, such that law does not ultimately support their decision, only provides a set of tool through which it can be channelled. This point is made by Frug, an author whose work on Legal Geographies we will consider in Chapter 4; See 'Frug, Gerald E. --- "A Critical Theory of Law" [1989] LegEdRev 5; (1989) 1(1) Legal Education Review 43', accessed 25 August 2018, http://www.austlii.edu.au/au/journals/LegEdRev/1989/5.html.

74 Schmitt, Political Theology: Four Chapters on the Concept of Sovereignty, ibid: 116

75 'Jokes and Innovative Action: For a Logic of Change. - Free Online Library', accessed 26 February 2018, https://www.thefreelibrary.com/Jokes+and+innovative+action%3A+for+a+logic+of+change.-a0173789267.

76 We should be careful here not to attribute a value-judgement to this 'normal situation'. It is not necessarily better or worse, more emancipatory or subjugating than the Law itself. Schmitt, as we know, will use his legal 'theology' to justify dictatorship. Nonetheless, what is of interest to us here is that for Schmitt the sovereign is a kind of empty mediator, who only stands in for a different, more dispersed or 'immanent' legitimacy, one which is effectively usurped within the process of rule-following.

77 Ludwig Wittgenstein, *Philosophical Investigations*, ed. P. M. S. Hacker and Joachim Schulte, 4th Revised ed. edition (Chichester, West Sussex,

U.K Malden, MA: Wiley-Blackwell, 2009): 244.

78 Gilles Deleuze and Leopold von Sacher-Masoch, *Masochism: Coldness and Cruelty & Venus in Furs*, trans. Jean McNeil (New York : Cambridge, Mass: Zone Books, 1991): 81.

79 Deleuze and Sacher-Masoch: 81.

80 For Deleuze, Kafka is the humourist who best understands the contemporary significance of Irony and Humour. Law, he tells us, no longer seeks to justify itself either by recourse to a higher authority, or good practical outcomes; since Kant, Law has become self-sufficient, as the rational form through which authority has been rationalised and channelled. This creates, for the post-Kantian subject, a kind of permanent 'crisis': "If the law is no longer based on the Good as a pre-existing higher principle, and it is valid by virtue of its form alone, the content remaining entirely undetermined, it becomes impossible to say that the righteous man obeys the law for the sake of the Best". The subjects of Kafka's universe know neither what authority the law represents, nor do they have any sense that its purpose is for the best, and as a result, they live in a kind of permanent 'state of exception'. That is, they live in a condition of presumed guilt, of overstepping boundaries without knowing them. Irony and Humour here take on different tones; The Irony of Kafka is the proximity of subjection and Sovereignty; his subjects recognise the emptiness of rules, and their mutability. His humour is the curious value with which punishment becomes bestowed; bereft of a transcendental schema, the only anchor that law provides is in the arbitrariness of its consequences: "All that remains is the indeterminate character of the law on the one hand, and the specificity of the punishment on the other. Irony and Humour immediately take on a different, modern aspect. They still represent a way of conceiving the law, but the law is now seen in terms of the indeterminacy of its content, and the guilt of the person who submits to it. Kafka gives humour and irony their full modern significance in agreement with the transformed character of the law." See Deleuze and Sacher-Masoch: 82.

81 Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (Vintage Books, 1970): xv. Foucault is quoting Borges, who is in turn referring to a (potentially apocryphal) citation attributed to Franz Kuhn, in his essay 'The Analytical Language of John Wilkins'. The encyclopaedia is used to ironize the ambitions of Wilkins to develop a linguistic system that would be, at one and the same time, a system of categorization for all things and concepts in existence. This ambition is mocked, via Chesterton, with the following: "He knows that there are in the soul tints more bewildering, more numberless, and more nameless than the colours of an autumn forest... Yet he seriously believes that these things can every one of them, in all their tones and semitones, in all their blends and unions, be accurately represented by an arbitrary system of grunts and squeals. He believes that an ordinary civilized stockbroker can really produce out of this own inside noises which denote all the mysteries of memory and all the agonies of desire" (G. F. Watts, page 88, 1904)." See Jorge Luis Borges, *Other Inquisitions, 1937-1952*, trans. Ruth L. C. Simms, Reprint edition (Austin: University of Texas Press, 1975).

82 There are a number of explicit references to *The Order of Things* within *Sorting Things Out*, but it begins with a tacit reference. The authors likewise introduce this book with a joke, from an episode of the X-Files, in which a detective realizes, with the help of a psychic, that a murderer murders because they are a Murderer. Bowker and Star, *Sorting Things Out: 1.*

83 The 'broken hammer' is used by Heidegger to distinguish between the ontological categories of present- and ready-to-hand; "Pure presence at hand announces itself in such equipment, but only to withdraw to the readiness-in-hand with which one concerns oneself — that is to say, of the sort of thing we find when we put it back into repair". Martin Heidegger, *Being and Time*, New Ed edition (Malden: Wiley-Blackwell, 1978): 73.

84 Agamben connects Kafka's story and Grandville's etchings, as part of a sketch on the uncanny property of the commodity. His observation that under Grandville's pen "objects lose their innocence and rebel with a kind of deliberate perfidy" might reminds us of Latour's notion of 'Reality' as 'that which resists'. Giorgio Agamben, *Stanzas: Word and Phantasm in Western Culture* (U of Minnesota Press, 1993).

85 Leigh Star, 'This Is Not a Boundary Object': 606-609.

86 Leigh Star, 'This Is Not a Boundary Object'; 605.

87 'On the Uses and Abuses of Infrastructural Inversion | Serendipity', accessed 18 June 2014, http://www.easterbrook.ca/steve/2010/08/on-the-uses-and-abuses-of-infrastructural-inversion/.

88 It is perhaps useful to point to a practical example of this distinction, to explain further the value seen in this by-design material. Within Folio 9, which explores the architecture of Scottish Building Standard 2.9.3, section 9.1 catalogues a series of diagrams that are seen as important in understanding the spatial consequence of that standard. The survey, presented in section 9.2, then studied the compliance of particular high-rise building. In doing so it trained the author to detect the consequences of this rule in application, ultimately informing the study of Xiaobailou Union Plaza (fig. 3.19), discussed within the dissertation. The series of speculative design proposals presented in section 9.3 – here completed by students supervised by the author – all contain their own discoveries, finding new ways to apply and interpret particular regulatory requirements. However, by taking these rules into a speculative context, imagining their potential significance, they were seen to distract the focus of the research from the aims of this dissertation. As such, the diagrams and surveys are referenced within the dissertation, while the proposals are not.

89 I reflect on the value of diagramming standards as an aspect of professional training in Liam Ross, "10 Projects for a Compliant Architecture" in Leo Care and Dan Jary, *Healthy Design, Creative Safety: Approaches to health and safety training in undergraduate schools of architecture.* (HSE Books, 2012) p. 113-128. I reflect on students diagramming standards as a means of visualising the 'affordance character' of the built environment in Liam Ross, "Invitation and Escape: Technical Standard and Tacit Knowledge in the Design Studio" in

90 While the ambition of this study was not to offer a systematic survey, with the benefit of hindsight an alternative logic for case-study selection did suggest itself, one which might have offered a more focussed basis for comparison. While Edinburgh is an important node for global fire-safety science, it exists as part of a network of other such centres, located in cities initially connected through collaboration on post-war reconstruction. That network today includes universities located in Tokyo, Lund, Berkeley, Maryland, Worcester Massachusetts, and Queensland New Zealand. The existence of a globally distributed but relatively bounded network of expertise itself suggests a framework for comparative study. How has the scientific expertise of this group of academics, well-known to each other, found different forms of application within their differing legal and phys-

ical contexts? The existence of this network was not known to the author in advance, and the significance of fire and fire-safety within the history of these host cities is not known to the author at this time. Nonetheless, this possibility is noted here as a reflection on the research methodology and as a potential topic for ongoing research.

91 There are notable attempts to offer such a comprehensive survey. *Flammable Cities: Urban Conflagration and the Making of the Modern World* offers a survey of eighteen cities, including Tokyo and Lagos. This publication is drawn upon explicitly in Chapter 6, but should be noted here to distinguish its ambition from that of this study. Bankoff, Lübken and Sand, by drawing together studies of these cities, and fires that occurred within them from the 7th to 21st Century, seek to establish the "foundation of a general typology of urban fire". Their ambition is quite distinct from that of the current study, for which fire remains a pretext to study the effects and side-effects of building standardisation. Nonetheless, these scholar note phenomena that can be observed within the city studies presented here; in the introduction to that collection they note that fire is a widespread and productive governmental concern, whose effects are historically and geographically particular, but which nonetheless travel around the world, carried on stories of great fires. See Greg Bankoff, Uwe Lübken, and Jordan Sand, *Flammable Cities: Urban Conflagration and the Making of the Modern World* (University of Wisconsin Pres, 2012). p. 4

3. Edinburgh
The Shape of the British National Anthem

On the texture of travel distance codes

3.1
Egress as a Matter of Fact and Concern

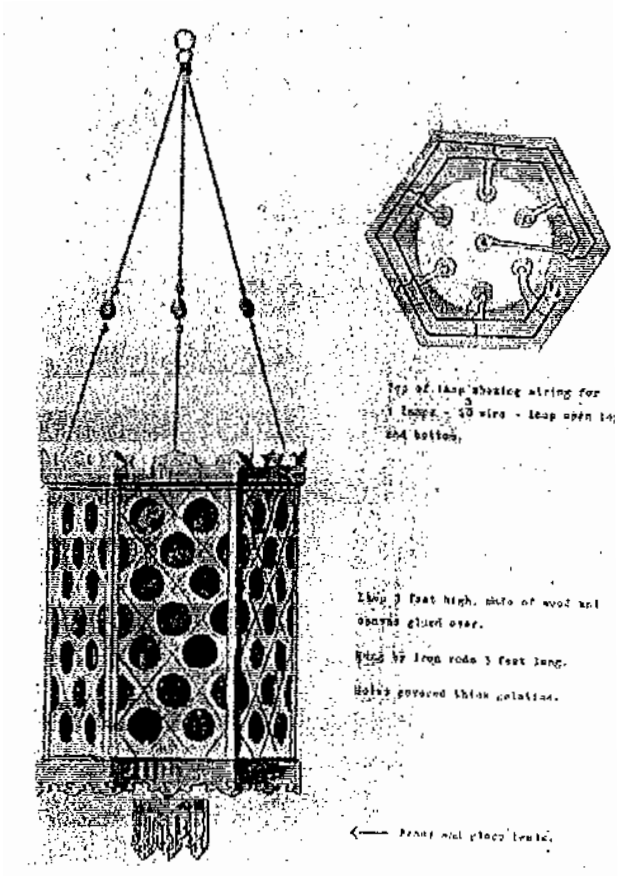
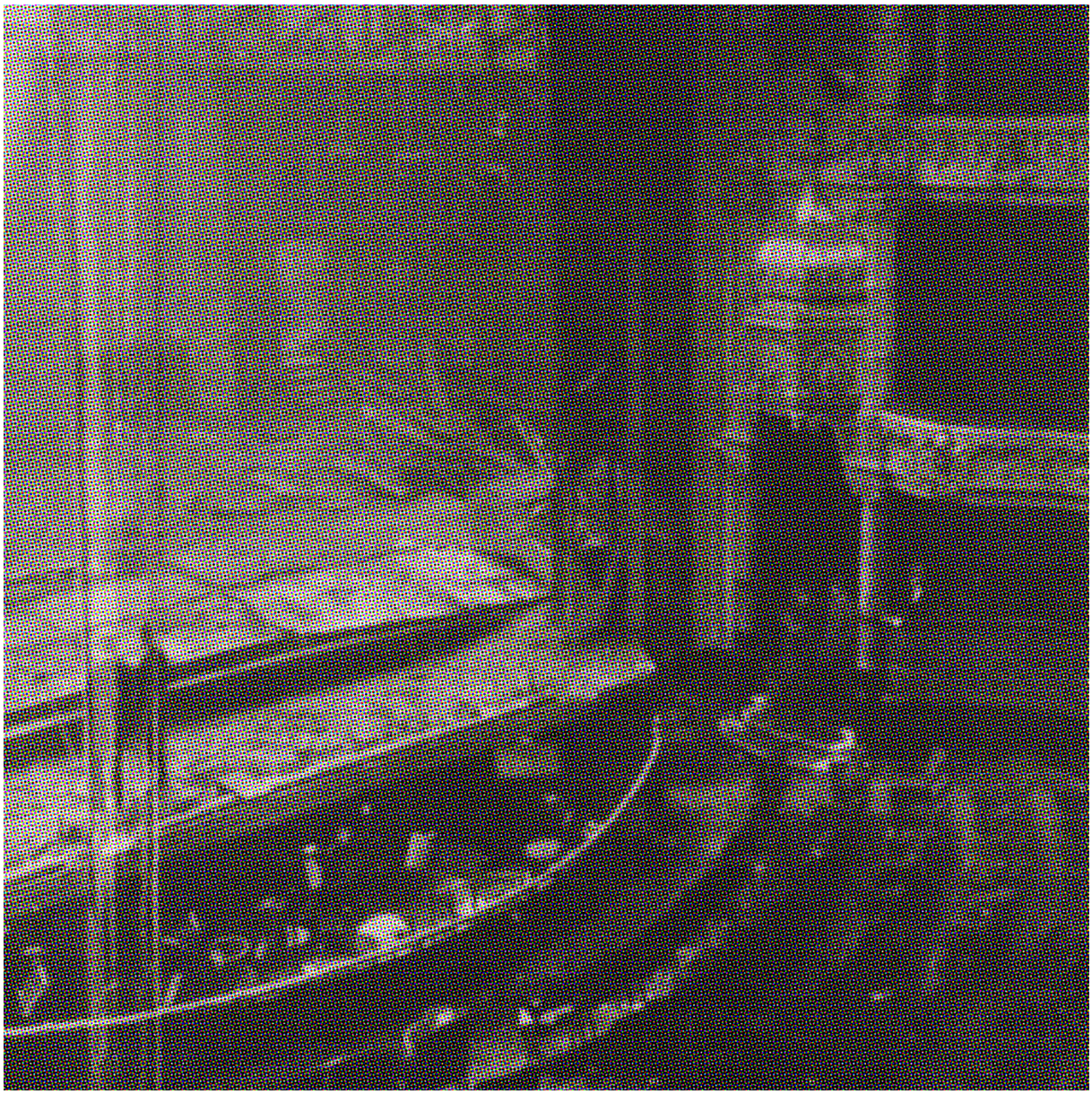


fig. 3.1
"Detailed Drawing of the Lamp"
Figure 19, British Fire Prevention Committee. 'A Report on the Fire at the Empire Palace Theatre on May 9th, 1911, Whereby Ten Lives Were Lost'. *Redbooks of the British Fire Prevention Committee*, 1911.

On the 9th of May 1911 there was a devastating fire at the Empire Palace Theatre in Edinburgh (fig. 3.2)[1]. 3000 spectators were packed into the building, watching part of a two-week sell-out show performed by The Great Lafayette, the highest paid performer of his day. Lafayette, whose real name was Sigmund Neuberger, was an eccentric quick-change artist who travelled the country in a private train-carriage, accompanied by his beloved and be-jewelled dog Beauty – a gift from Harry Houdini - who he indulged with dangerous quantities of rich food. The show that night was set to a Persian Harem theme and involved a cast of fire-eaters, jugglers, contortionists and midgets, as well as a 15-year-old girl who operated a mechanical teddy-bear, a live Lion, and Lafayette's prize stallion, Arizona. During its finale, *The Lions Bride*, a young woman in oriental dress entered the Lion's cage. The animal stopped pacing, approached the woman, and roared. But just as it was about to pounce, its skin suddenly fell away to reveal Lafayette, who had mysteriously changed place with the beast. At the end of this act, which was to be the magician's own swan song, a lantern (fig. 3.1) "of oriental design, made of wood, with gelatine transparencies of various colour… lighted by seven 8 candle-power lamps"[2], fell from the rigging, setting fire to the rich draperies of the scene (fig. 3.4).

The audience, who were in a state of suspended disbelief, were slow

fig. 3.2
"Empire Palace Theatre Fire After the Fire"
Photographer unknown. Source: http://www.wakefieldfhs.org.uk

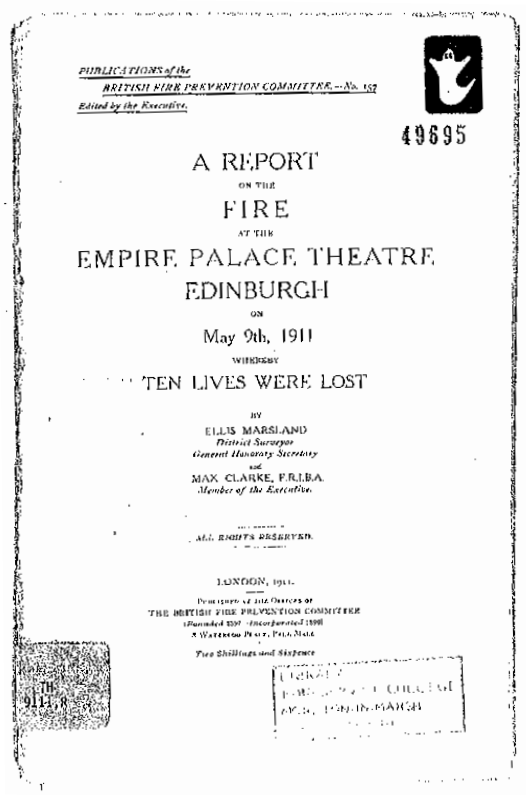


to react. They were only saved, according to newspaper reports, by a quick-witted conductor, who roused the band to a rendition of *God Save the King*. This brought the patriotic crowd to their feet and snapped them out of their trance. All of the fee-paying guests escaped unharmed. A different fate, however, awaited the performers. An automatically deployed fire-curtain became trapped inches above the stage, creating a powerful draught that fanned the flames. And Lafayette had locked the back-stage doors, in order to guard his professional secrets. Both of these precautionary measures backfired; all 10 cast-members were killed, and Lafayette's charred remains were discovered twice, revealing his use of a body double. The ashes of both men were sprinkled between the paws of his dog Beauty, who had died portentously, of apoplexy, only a week earlier. A quarter of a million people gathered at Piershill cemetery in Edinburgh for his funeral in crowds greater than those who welcomed George V,[3] on his royal visit, the following month (fig. 3.10).[4]

Remarkable as this story is – being rich in Edwardian tropes of empire and patriotism, mesmerism and fate – perhaps more remarkable is the fact that details of this event form the evidence-base of a number of contemporary building standards. The 1911 fire was the subject of a dedicated report by the British Fire Prevention Committee (fig. 3.3). That report was influential, for instance, in establishing the mandatory use of fire-curtains, despite their tragic consequence in this instance. It also established 'clearance time' as a regulatory concept. Contemporary newspaper accounts suggested that the audience escaped within the time it took the band to play the national anthem. While that song varies in length, depending on the tempo and number of verses (to the chagrin of British sporting champions, It can be over in as little as 44 seconds[5]), an official three-verse, andante rendition takes about two-and-a-half minutes to play, and it is this time that has since been taken to define our requirements for safe clearance time.

Space-Time Continuum

This temporal code, in turn, supports a number of *spatial* standards. The 1952 report *Post-War Building Studies no. 29 Fire Grading of Buildings*, for instance, uses it to standardise the width of exit doors and stairs, and to define the maximum occupant capacity of rooms and floors. Citing the Fire Prevention Committee's 1911 report, this document suggests that if buildings can be evacuated within 2.5 minutes "there will be no serious risk of panic".[6] But recognising that clearance time cannot be controlled directly, it suggests that "this factor is controlled indirectly by the requirement for exit width". Citing studies by the French Fire Brigade and the U.S. Bureau of Standards it offers an average value for the rate at which people file through exits ('discharge rate'), and develops a new integer of measurement, based on average shoulder width (a twenty-one inch 'unit of exit'). By multiplying these values by 2.5, it defines the maximum permissible number of occupants within a



PUBLICATIONS of the
BRITISH FIRE PREVENTION COMMITTEE.—No. 157
Edited by the Executive.

49695

A REPORT
ON THE
FIRE
AT THE
EMPIRE PALACE THEATRE
EDINBURGH
ON
May 9th, 1911
WHEREBY
TEN LIVES WERE LOST
BY
ELLIS MARSLAND
District Surveyor
General Honorary Secretary
and
MAX CLARKE, F.R.I.B.A.
Member of the Executive.

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LONDON, 1911.
Printed at the Offices of
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[Founded 1897 Incorporated 1906]
5 Waterloo Place, Pall Mall.
Two Shillings and Sixpence

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fig. 3.3
'A Report on the Fire at the Empire Palace Theatre on May 9th, 1911, Whereby Ten Lives were Lost'
British Fire Prevention Committee. *Redbooks of the British Fire Prevention Committee*, 1911.

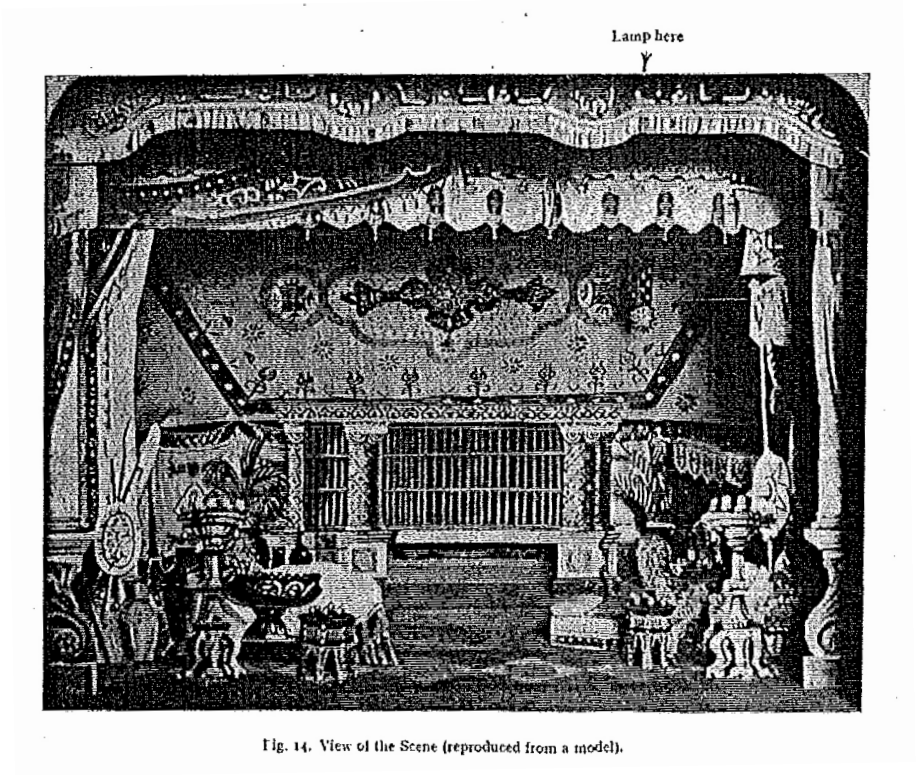


Fig. 14. View of the Scene (reproduced from a model).

fig. 3.4
'View of the Scene (reproduced from a model)'
Figure 14, *Redbooks of the British Fire Prevention Committee*, 1911..

room, or storey:

> The discharge values of exits of different widths from a single floor may now readily be calculated. On the basis of a discharge rate of 40 persons per unit per minute and a clearance time of 2.5 minutes, each unit of exit width could deal with 40 x 2.5= IOO persons.[7]

This same set of relations are today defined by *British Standard 9999: Code of Practice for Fire Safety in the Design, Management and Use of Buildings*[8]. This offers the more nuanced W=((N/2.5)+(60S))/80, relating occupants (N), doors (W) and stairs (S). The constant remains a target clearance time of 2.5 minutes (fig. 3.5, 3.6).

Where these concerns intersect most directly with architectural design, though, is through the regulation of travel distance. This concept is outlined in the post-war building studies and British Standards but is also enforced by UK law. In Scotland, it is defined by Building Standard 2.9.3 as "the distance that occupants have to travel to a protected door". This distance is again limited to ensure that occupants can escape "before there is a noticeable accumulation of smoke in the route of escape".[9] This dimension is perhaps the most spatially and economically significant of building standards. It establishes the maximum permissible plan depth of a building, and the number of stairs it requires, effectively setting a national ceiling for gross-net ratios, which in turn sets the bottom-line for speculative developers. The actual distance permitted varies significantly depending upon the type of building, its 'occupant profile' and the number of available means of escape: from 9 metres in the case of a residential care homes with one escape stair, to 100 metres for a roof-top plant-room with at least two. These dimensions, however, are likewise derived from a common formula, one that now multiplies a range of 'discharge rates' by a minimum door width (two shoulders-widths), and the now-familiar constant of 2.5. It is this formula that means Scottish buildings are required to have smaller rooms, wider doors, or more stairs, for instance, than those south of the border; Scots are presumed to have wider shoulders than the English. As to whether this is on account of rude physique, or a need to wear coats indoors, is moot[10].

Contingent Universals

This set of compound equations creates a kind of ghostly performance; a choreography of assumed door-widths and maximum corridor-lengths, peopled by averagely broad shoulders, moving at a dignified pace. This performance is a spectral re-production of Neuberger's swan-song, a real event, fossilized into norms and coefficients, one that echoes and reverberates through every room, floor, and corridor and door in Scotland. And just like that show, this production seems to depend upon a sleight-of-hand; on our suspension of disbelief as plausible phenomena are conjured from thin air, their back-stage mechanics protected by the stage-doors of formulae.

WIDTH OF EXIT OR STAIRCASE	3′ 6″	4′ 0″	4′ 6″	5′ 0″	5′ 6″	6′ 0″
Discharge value for evacuation time of 2½ mins.	200	230	260	290	310	340

fig. 3.5
'Width of exits'
Table 8, p. 79, 'Fire Grading of Buildings (Parts II, III, IV)'. Post-War Building Studies No. 29. Ministry of Works, 1952.

Table 'Buildings with a single floor or separate stairs from each floor, discharge values of exits and staircases',

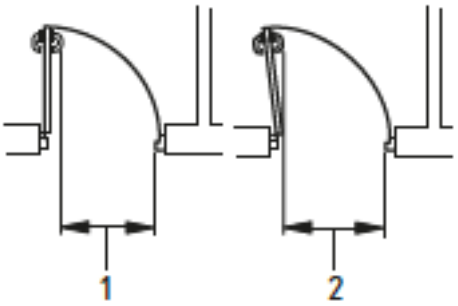


fig. 3.6
'Measurement of effective door width'
Clause 16.6.1, fig.14, p. 86 British Standards Institute. *BS 9999:2008 - Code of Practice for Fire Safety in the Design, Management and Use of Buildings – BSI British Standards*. BSI, 2008.

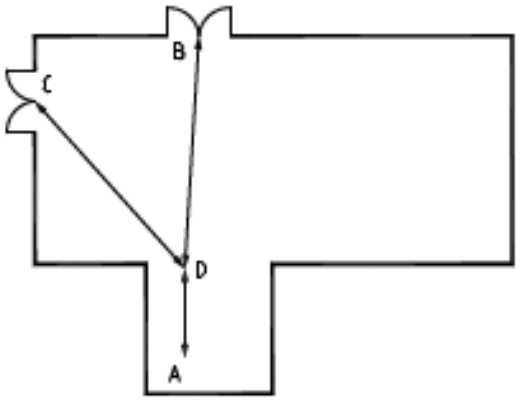


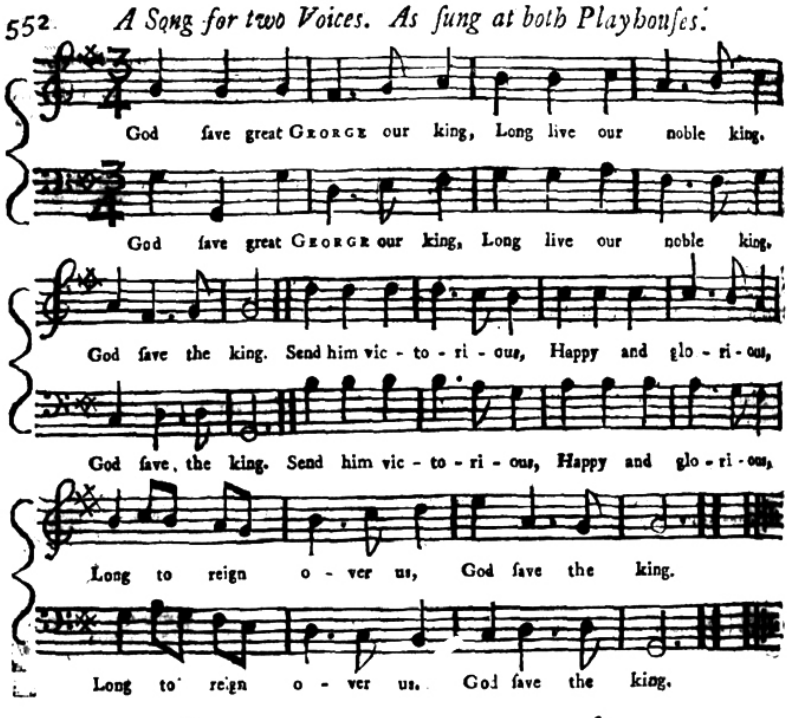
fig. 3.7
'Escape routes 45 degrees or more apart'
Clause 16.3.2, fig. 7, p. 75. *BS 9999:2008*

We could approach this performance critically, of course, and try to break its magic circle. A first place to start would be with the original newspaper report. Whether the audience really escaped in the duration of the tune is uncertain; it's reasonable to assume that accuracy was here a secondary to the value of a pithy story through which adversity is overcome by obedience. What we do know, however, thanks to the Fire Safety Committee's report, is that fire and smoke never overcame the auditorium; the blaze was trapped backstage, and the auditorium provided a capacious smoke-reservoir. Nonetheless, that committee likewise suggested 2.5 minutes be adopted as a maximum. A third sleight comes from the Post War Building Study. This study went further, attributing the *calm* of the audience, not to the song itself, but to its duration, making this accidental characteristic appear essential. And this accident is further sublimated within those studies - and in those later standards that employ its formulae – being trans-substantiated into the width of a door. A final puff of smoke is added by Scottish Building Standard 2.9.3; despite recognizing clearance time as being determined by occupant capacity and exit width and understanding the effect of ceiling height on the gathering of smoke, it nonetheless offered a linear transcription of 2.5 minutes, through which to limit the size of rooms and floors.

These scientific aporia are not unknown to fire safety experts, but they elicit a variety of response. This case study began, for instance, with laughter; embarrassed laughter from the Head of Building Standards in Scotland, while recounting to me the origin of the 2.5-minute rule, and its evident ambiguities, redundancies and deficiencies. For academics, however, this story is frustrating. It undermines their attempts to constitute a 'science' of fire-safety, as well as making it hard to enjoy a night-life: "The whole experience of being a fire engineer has made it impossible for me to enjoy nightclubs" says Luke Bisby, Professor of Structures and Fire at the University of Edinburgh. "You spot mistakes everywhere… they have limited exits, and a lot of people, and I just can't go in. Or else I go in and stand right by the door, waiting for something to happen". Such concerns are not limited to places of assembly, or to the problem of escape:

> "If you are looking for it you can see fire engineering, particularly in a modern building, absolutely everywhere… the manufacture of the carpet, the things that are covering the walls, the latches on the windows, the plugs, the fire alarms, the sprinklers – everything about the room.[11]

And if this engineering is based on bad science – like data from a fire in Edinburgh more than 100 years ago - that doesn't create confidence; "I think there's a need to make sure all of our regulation is based on rational thought and if we can prove that in certain cases it isn't, and that that either causes a safety risk or stifles innovation unnecessarily, we should do something about it". But many fire safety consultants are grateful for the assumption embedded


552. *A Song for two Voices. As ſung at both Playhouſes.*

God ſave great GEORGE our king, Long live our noble king.

God ſave great GEORGE our king, Long live our noble king.

God ſave the king. Send him vic - to - ri - ous, Happy and glo - ri - ous,

God ſave the king. Send him vic - to - ri - ous, Happy and glo - ri - ous,

Long to reign o - ver us, God ſave the king.

Long to reign o - ver us. God ſave the king.

fig. 3.8
'A song for two voices. As sung at both Playhouses'
The Gentleman's Magazine, 15 (October 1745): 552

fig. 3.9
'Funeral of the Great Lafayette. Some Floral Tributes'
May 1911. Photographer unknown. Source: http://graveyarddetective.com

within this code, indeed suggest that their discipline could not exist *without* them. If this 'science' is to be inscribed into the built environment, and awarded the force of law, a line must be drawn somewhere, by someone. It is not unheard of for fire engineers to make the pilgrimage to Piershill cemetery (fig. 3.9), and to say a few words of thanks to Sigmund and his Dog, considering their consultancy fees his greatest 'trick' ever.[12]

That is, the 2.5-minute rule seems to create, within fire-safety science, a problem of 'sovereignty' in miniature. The line that it draws can seem arbitrary, absurd, even magical, a means of conjuring a position of authority, as if from nothing. Paraphrasing Foucault, we might be tempted to agree that, even within this apparently technical disciplines, our thinking remains under the spell (in fact, it seems quite literally *enchanted*) – by monarchy. But to view things from this perspective is to concern ourselves only with matters of *fact*. It is not hard to debunk the assumptions that underpin BS9999 or SBS 2.9.3, but such an anti-fetishistic gesture – at least as it is offered by fire-safety scientists – is often just a means to project an alternative positivism. To be sure, if we're clever, we can knowingly transgress this rule (a topic we will consider at length in Part 6), but by doing so we will necessarily direct our *concern* away from the problem of occupant safety. Rather, I think it is possible to reflect upon the 2.5-minute rule from a different perspective, one that is based precisely on the *accidental* networks that connect theatres, mesmerism, anthems, and fire.

Gathering in and around Theatres

A first step in adopting this perspective would be to recognize the governmental problem of egress as *emerging* from the theatre. Theatre fires were commonplace during the development of our building standards. The site of the Empire Palace, which now houses the Edinburgh Festival Theatre, was previously occupied by a string of other theatres; Ducrow's Circus, Pablo Fanque's Amphitheatre, Dunedin Hall, Southminster Theatre, Queen's Theatre, and Newsome's Circus. The last three of these all burnt down, in 1875, 1877, and 1887 respectively. That the auditorium of the Empire Palace survived, along with its occupants, did indeed make it a 'good fire', a model to be emulated. That is, there is a material and historical link between theatres and the problem of egress, one which both is, and is not, accidental; theatres gather people in large numbers, and dense arrangements, in unfamiliar environments, in order to suspend their disbelief through remarkable, often flammable, spectacles. In doing so they provide both the prompt, and the worst case, for the legislation of egress.

A second step would be to recognize that the theatre – specifically the Royal Playhouses of Drury Lane (fig. 3.11) and Covent Garden – likewise gave rise to the national anthem. The origins of the mel-

fig. 3.10
King George V of England visits Edinburgh, 1911
Photographer unknown. Source: Alamy.com

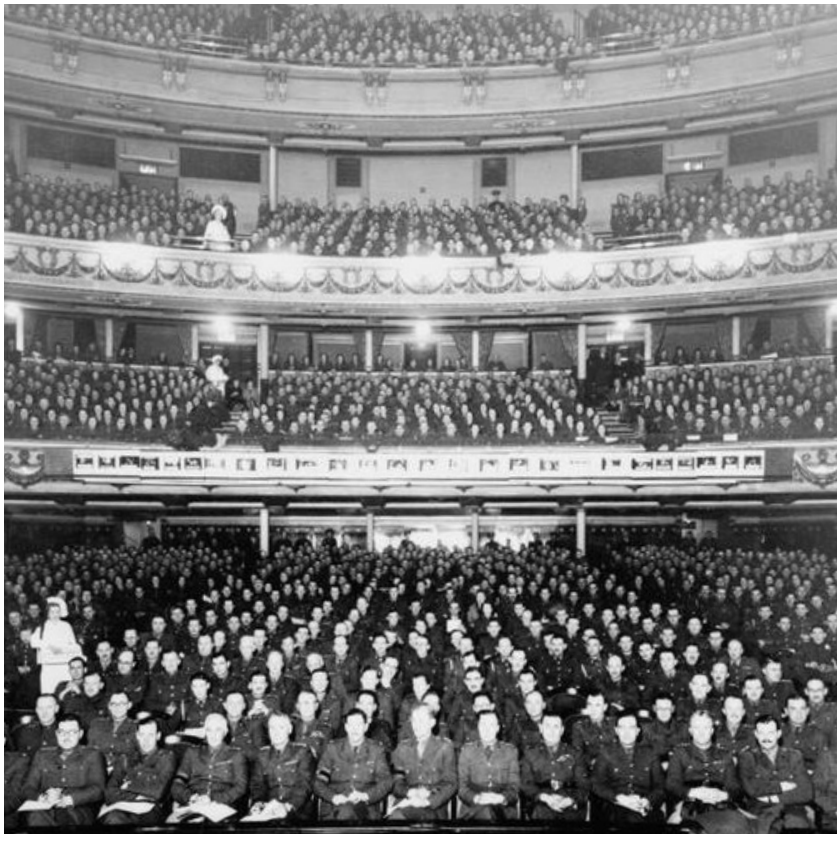


fig. 3.11
"Audience at an entertainment by E.N.S.A at Drury Lane Theatre, London, 27 March 1940"
Photographer unknown. Collection of the Imperial War Museum

ody of that song are unclear; attributed to Handel, it bears a close resemblance to a folk theme, as well as an earlier piece by Jean-Baptiste Lully, *Grand Dieu Sauve Le Roi,* written to celebrate Louis XIV's survival of an operation to remove an anal fistula. The circumstances that led to its adoption as the British national anthem, however, are well documented. The lyrics were first published on 15th October 1745, by *The Gentleman's Magazine*, as "A new song for two voices. As sung at both playhouses" (fig. 3.8). The date is significant; this new song was first sung as a gesture of support for George II, following his defeat in Prestonpans, at the hands of the 'Young Pretender', Charles Edward Stuart. With the Jacobite army gathering in Newcastle, *The Gentleman* launched a counter-offensive, an attempt to normalise and nationalize this metropolitan gesture, enrolling the provinces to its cause.[13]

I think it is possible then - with both Latour and Schmitt in mind - to see why the newspaper reports of May 10th 1911 offer such a compelling basis for legislation concerning fire-safety. Those accounts drew together – by accident or design - the real and experienced threat of theatre fires, and a device of collective solidarity that had, by that time, been adopted even in Scotland. The 'science' of the 2.5-minute rule would not, from this perspective, be located in the *accuracy* of that limit, but rather in its capacity for adoption*;* the rule succeeded in enrolling a set of pre-existing actors – the theatre, the anthem, and their associated codes of behaviour – into the construction of a broader and more distributed network which, through the standard, could be inscribed into our entire building stock, and support new governmental and technical practices. That the national anthem is used to establish this limit should not suggest its dependence on a single or localisable position of 'sovereignty'; rather, in this case, what *God Save the King* points to, ironically, is an 'everyday frame of life', a pre-existing, pre-legislative, 'regularity'. While this frame of reference makes recourse to concepts of nationalism, patriotism, religion and monarchy, these are themselves accidental predicates; the 'immanent validity' of the rule stems from its capacity to evoke primal drives – fear, loss, regret – and to channel their replacement through collaborative action. Bringing the language of Latour and Schmitt together, then, we could say that the 'matter of concern' at stake here – the thing that this standard attempts to assemble - is that of extending an effective 'normal situation', one in which the population behaves calmly in a situation of mortal peril. To debunk its functionally necessary assumptions about occupant behaviour, for instance, would be to ignore the reflexive form of legitimacy and effect that it seeks to generates; the ambition of the 2.5-minute rule is to *construct* – through theatres, mesmerism, nationalism and anthems – a 'homogenous medium' of occupant response.

The Aesthetics of Escape

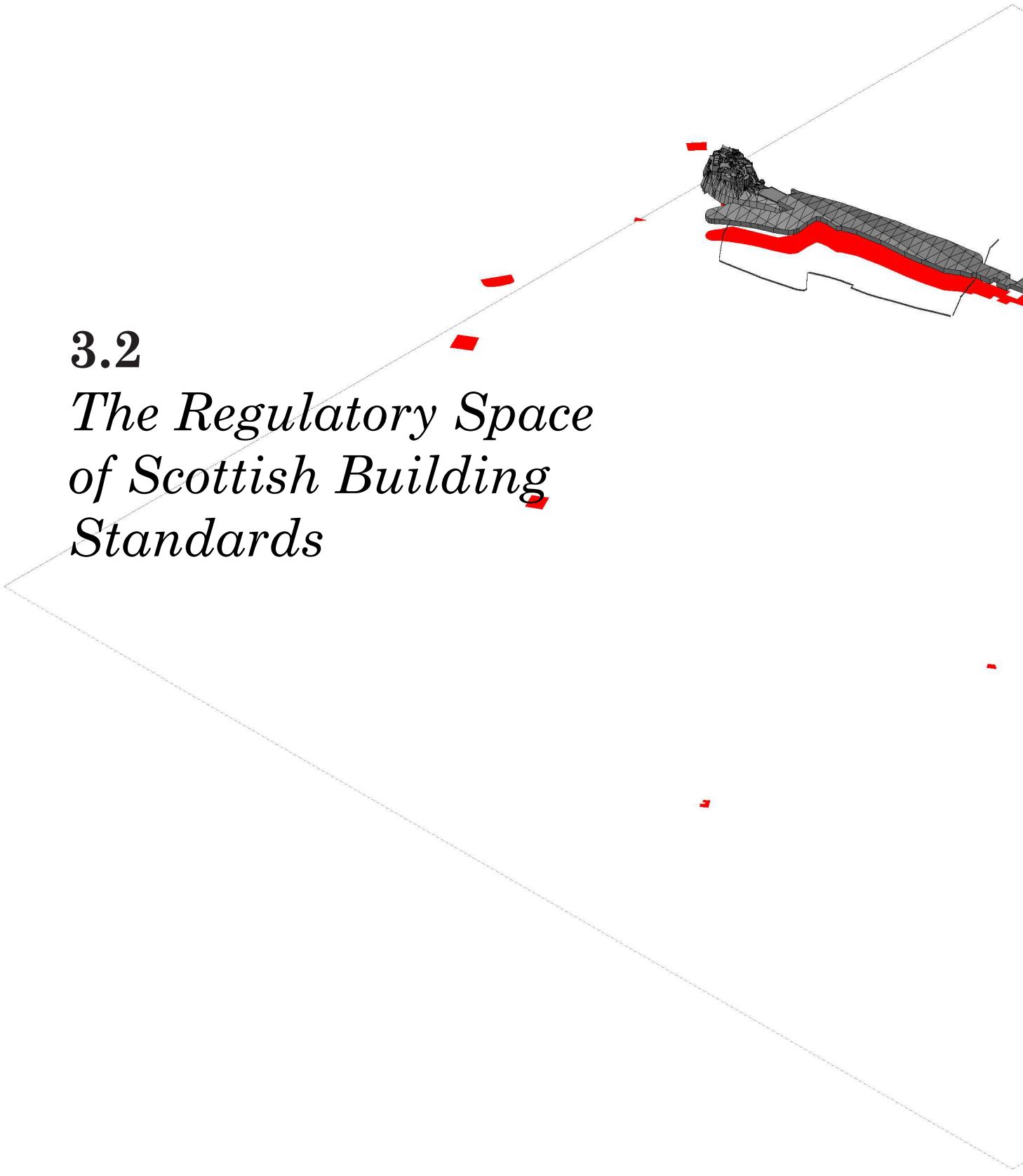
If we set matters of 'fact' to one side, and enrol ourselves in this common concern, some different problems emerge, ones which reveal an

aesthetic dimension within the scientific and legal paradigms adopted. Let us approach them through a question: Why did the Building Research Establishment, the British Standards Institute, and the Scottish Building Standards Agency not legislate to require that all fire-alarms sound to the tune of their respective national anthem? That is, while the legislative decisions of those bodies draw upon that *tune* for their legitimacy, they do not seek to reproduce it, but rather to *replace* it. This process of replacement is evident in the pre- and post-legislative scene implied by this act of standardisation. In the first, a fire breaks out, a band strikes up, and an audience exits safely, thanks to their schooled familiarity with the piece of music. In the second, *the effect of that music is already written into the architecture*; a fire breaks out, an alarm sounds, and the audience departs safely, their calm ensured now by a schooled familiarity with adequately wide exits, emergency exit lighting, and designated escape routes. Should the alarm ring to the tune of *Grand Dieu Sauve Le Roi*, these two scenes would overlap; the familiar melody would echo and reverberate around a room whose door widths and plan arrangements, and whose number of occupants, were already its echo. And while this does not happen in fact, this overlap is the fantasy of the code; eager students of national historical consciousness as well as fire-safety protocols, the imagined escapees of future building fires are humming Handel's tune as they file to the nearest exit; its mood music reverberates and resonates within and between their minds, legal codes, and codified buildings.

But this scene is, of course, another utopia; a perfect impossibility. The representation here replaces the thing, in two ways; alarms, doors and rooms are the automata that make heroic conductors redundant, just as the scenography of normalized escape, if it is effective, gradually supplants our common experience of fire. If there is a sort of poetry to the 2.5-minute rule, then, is it not one of resonant fullness, but rather the evocation of absence. Like Pliny's 'Corinthian Maid', we have lost our hero, and are left only with a trace of his shadow, scratched onto (or into) our walls; or like Orpheus, making our own escape, we have turned to lose Eurydice, choosing instead music (and, of course, our lives).[14] By looking for the evidence of fire-safety standards in our building - fire alarms, illuminated signs, exit doors, designated routes, muster points, and plan geometries – what we see is that architecture is just as haunted, and haunting, just as connected to loss and mourning, as are the arts of drawing or music. Intentionally or otherwise, these devices drag something of a cry into the clausal structure of buildings, a cry that they nonetheless seek to replace, to save us from experiencing.

What response does that cry elicit? Will it be one of Edwardian patriotic solidarity, or Millennial apathy? What pre-legislative resources of suggestibility will decide this question? And what becomes of a standard once it succeeds in emptying out the anthropological fullness that it depends upon? These questions bring us, I think, to the specific governmental shifts that are brokered by the 2.5-minute rule, and perhaps to some constitutive limits of 'infrastructure'

as a technology of governance. That is, the 2.5 rule negotiates a shift between an actively disciplinary govern-mentality – standing up for the King – and a passive, dispersed, technologically mediated one – safeguarding the population through the design of their buildings. The promise of this transition – already described so well by Bentham, Foucault, and Wallenstein – is that architecture might 'free' the population from spectacles of subjugation, and disciplinary training programmes, by sublimating their obedience within itself.[15] But this sublimation can never be absolute; most governmental problems require our active participation. Relations between things can never fully replace relations between people; a moment of subjectification is still required. It is here that some of the practical problems of a liberal govern-mentality coincide with the methodological concerns of 'infrastructure studies'. What is needed is a moment of 'infrastructural inversion', when our capacitating structures suddenly 'stand out', and become obstructively present. There is an active work of historical imagination needed on the part of architect, or the fire-safety engineer, to see the contingencies of the 2.5-minute rule as meaningful. Likewise, there is active and imaginative work needed on the part of building managers and occupants, through fire-escape drills, to turn the ready-to-hand character of the everyday environment against us, inducing fear, and prompting displays of obedience. Within this work we might see something like an aesthetics of governmentality; an act of representation and substitution through which we share an experience at the same time as being saved from it. This work calls for a delicate, even impossible balance; the reductive nature of the code, or the unlikeness of the simulation, might earnestly school us in sarcasm and irony. And in this aesthetic balance we see something of the subjectivity that attends to liberal govern-mentality, one that inflates concerns at the same time as it evacuates their lived experience, one that has to cry wolf so as to keep itself running.



3.2
The Regulatory Space of Scottish Building Standards

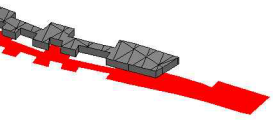


fig. 3.12
15th C. Edinburgh Plan
Liam Ross, based on John G. Bartholomew, *Chronological Map of Edinburgh*, 1919.

Diagram showing surrounding farms, city wall, extent of burgh (red) and height of burgh (grey).

The ambition of this first case-study on fire-safety legislation is two-fold. First, it seeks to demonstrate how regulatory frameworks emerge from historically and geographically specific contexts. Secondly, it seeks to describe how regulatory frameworks re-shape that context, bringing to it their own materiality, texture, or *techne*. In the opening section above, I sought to use the 2.5-minute rule as a way into this reflection. I noted some scientific and legal aporia suggested by its rationale, at the same time as outlining the concern that it seeks to gather and extend. In doing so, I suggested that the rule brokered a change in governing mentalities, one that was both prompted, and shaped, by the 'accidental' characteristics of that rule.

In this second section I extend that descriptive ambition from a single rule, to an entire legal framework. At the same time, I give it a name, through the concept of 'Regulatory Space', borrowed from contemporary literatures on regulatory governance. After defining this term, and the way I wish to extend it, I offer a brief genealogy of the development of Scottish fire-safety legislation. My specific focus will be to identify the way in which this framework has shaped, and been shaped by, the physical fabric of the city of Edinburgh; I will recount acts of legislation, prompted by specific events and buildings, which are then reflexively re-inscribed into the city. Reading *between* such legislative initiative, I hope to describe more fully the kinds of governmental transformations that fire-safety regulation has supported, and the role of the built environment within those transitions. What follows is therefore not a comprehensive history of this legislative framework, but a series of exchanges between the City and Law, a series of moments in which govern-mentalities confront and critique each-other, in physical form.

Metaphorical Space, Concrete Poetry

In *Capitalism, Culture and Economic Regulation*[16] Leigh Hancher and Mick Moran coined the term 'Regulatory Space', an analytical concept that described their approach to the study of regulation in liberal-democratic, capitalist political economies. While not readers of either Foucault or Latour[17], their ambition in doing so will resonate with concerns already outlined here. Hancher and Moran suggested that, at the close of the twentieth century, the critical horizon of commentary on regulatory governance were limited by the problem of 'regulatory capture', the concern that governmental initiatives, authorized by public bodies, tended to be re-directed, and re-purposed to serve the interests of private companies. While sympathizing with that concern, Hancher and Moran nonetheless suggest that the literatures on 'capture' were limited by two fundamental assumptions; that there *exists* a sovereign authority that reliably represents a definable public interest, and that regulation is its instrument to assert that interest *against* private gain. Hancher and Moran suggested that any attempt to clarify and legitimate

such an aim and ambition was inadequate to the complexities of a neo-liberal context in which, for example, the most commonly adopted vehicle for the advancement of private interest is the public company, and in which governmental roles traditionally associated with the state are intentionally dismantled so as to create opportunities for entrepreneurial activity.

They developed this concept so as to describe regulation as a *space*, rather than a line. As we have seen, the concept of 'regulation' often returns us to problems of sovereignty, to the King. This is its etymological root; from the ruler comes the rule, and from the decision, the drawing of lines.[18] For Hancher and Moran, these connotations are misleading; regulatory frameworks demarcate an 'issues arena', matters of common concern, whose limits are defined less by sovereign decision, more by the concord and discord constructed between a wide range of actors. The spatial trope offered them a way to describe that arena which, like an architectural plan, operates through partitions of inclusion and exclusion, and creates uneven allotments. Further, like historical cities, they recognized that regulations emerge in different historical and geographical contexts, and that their public/private divides fall along different lines from place to place, and from time to time. And this trope allowed them to stress the notion that regulations are there to be *occupied*. The lines that they draw are not simply barriers; they shape legal and governmental opportunities whose ultimate effect is steered less by *intent*, more by the way they are used. While offered as a way to describe the working of regulation within a Neoliberal context, the concept has created its own discursive opening, and since 1989 it has supported a wider discussion, one that describes the process of regulation as a territorial struggle which constantly redraws the "frontiers, outposts, and mobile boundaries" between that which we call 'public' and 'private'.[19]

Hancher and Moran use the term 'space' here in a strictly metaphorical sense, but the issues that they describe are also *literally* spatial. Physical space is often the object and means of governmental action; the common thing around which matters of concern emerge, the necessary vessel through which to gather and form agreement, and the tool through which that agreement is cemented in reality. We have seen that the 2.5-minute rule, for instance, depends upon and constructs an 'arena' in both of these senses; indeed, that example suggests a kind of poetic relationship, developed through successive processes of abstraction and transcription; the theatre is, after all, the spatial prototype of the court-room, just as the agonistic drama is the prototype of the trial[20]. That is, while 'space' might offer a convenient trope though which to understand Law, in reality the two are already engaged in a much more complex set of exchanges between the metaphorical and the literal; characteristics of the built environment are assumed by and transfigured by law, and when they are built, those representations become nested within the original 'thing'. It is with a view to finding such moments of reflexive re-inscription, moments in which we recognize law as both literal-

ly and metaphorically *spatial*, that I will now describe Scotland's fire-safety legislation.

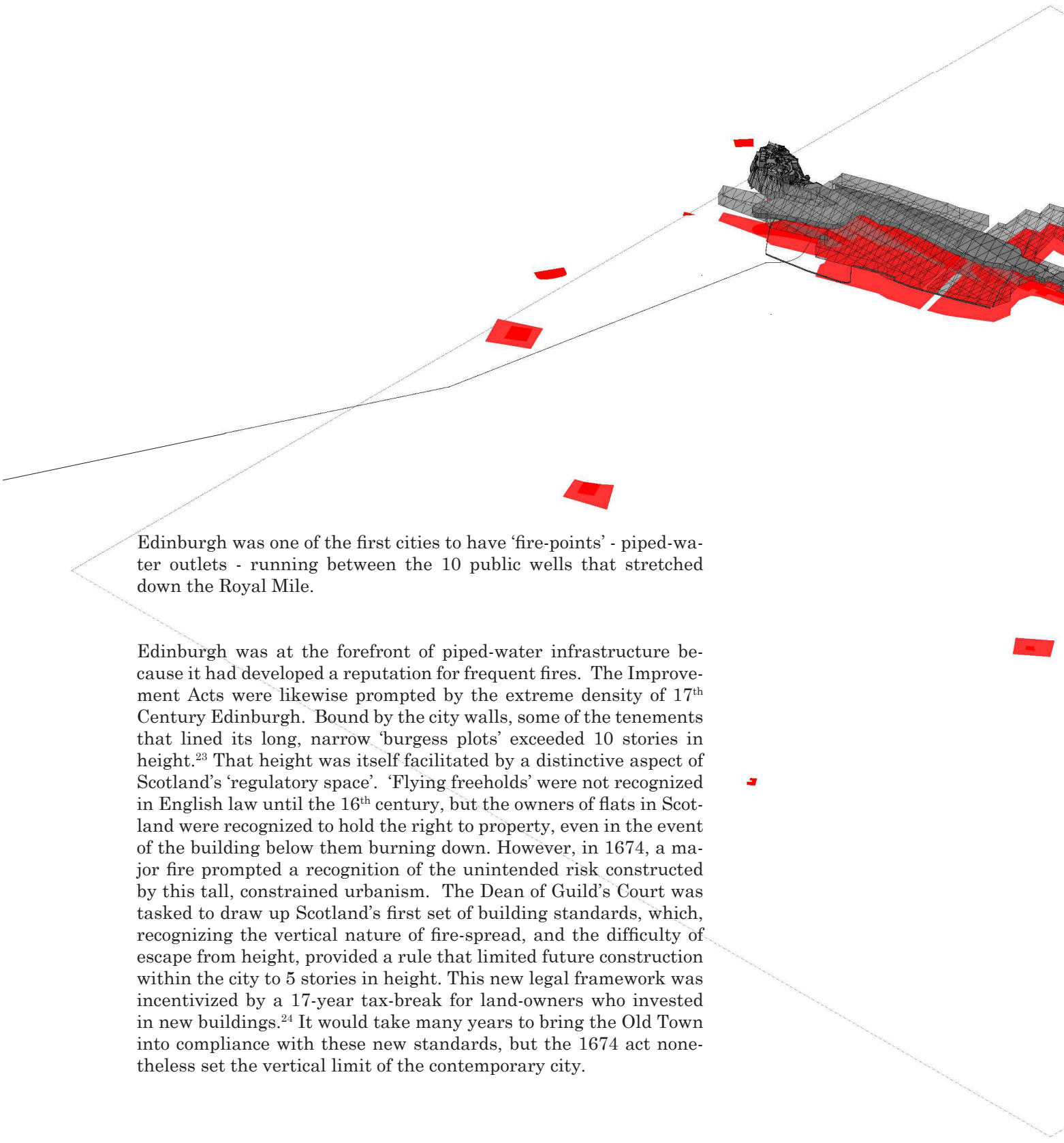
Candles, Curfews and Common Women [fig. 3.12]

As Alexander Reid notes in his history of the Scottish fire services, Towns and cities were late to develop in Scotland.[21] Lacking dense nucleated villages, the country was one of isolated farmsteads until David I imported the concept of the 'Royal Burgh' from Newcastle. This new spatio-legal tool came with its own laws (*Leges Burgorum*) and was introduced as means to bring international trade under royal control. Within the Burghs, foreign merchants and cosmopolitan trades-people were granted 'freedom' from baronial feu duties. These freedoms were expressed and ensured by military infrastructures, walls and gates, that the Burghs enrolled and extended.

Prior to these Burghs, there was no legislation concerning fire-safety in Scotland. Fire was a matter of personal responsibility; if your farm burnt down, it was probably your fault, but definitely your problem. The increased risk constructed by dense settlements, however, prompted a recognition that it would be 'profitable' to develop forms of communal assistance and precaution. The first act of parliament to do so was the Scottish Act, passed by James I, during his third parliament, on March 11th 1426. This legislation established a punishment for arson, moved specific things and people out of the towns, and established a curfew (in these predominantly French-speaking settlements, a *couvre-feu* was to 'cover the fire'): it decreed that "no stray hay, heather nor broom be put above the flame in houses with fires"; that "sellers of hay not enter their hay house with a candle"; that "that no fire be fetched from one house to another within the town except within a covered vessel"; that "common women be put to the utmost ends of the town where there is least peril of fire, and that no man make a home for them in the heart of the town"; and that "if burning happens in any town, and [the fire being] found to be deliberate, the punishment shall be forfeiture [of property, to the Crown]".[22]

Distant Networks, Vertical Limits [fig. 3.13]

It was not until the 17th Century that such legislation was extended to consider the flammability of construction materials themselves. The Improvements Act of 1621 stated that "to prevent fire, the houses of Edinburgh shall be roofed with slate, lead, and tile… instead of straw or boards". A further Improvements bill, in 1677, extended this requirement to outlaw construction in wood. The 1621 Act also provided the first legal and physical infrastructure for fire-fighting, through measures for "the supplying of water to the city from a distance". It would take 60 years to build a damn in the Pentland hills, and lay a connecting mains to the Castle Hill reservoir, but by 1681



Edinburgh was one of the first cities to have 'fire-points' - piped-water outlets - running between the 10 public wells that stretched down the Royal Mile.

Edinburgh was at the forefront of piped-water infrastructure because it had developed a reputation for frequent fires. The Improvement Acts were likewise prompted by the extreme density of 17th Century Edinburgh. Bound by the city walls, some of the tenements that lined its long, narrow 'burgess plots' exceeded 10 stories in height.[23] That height was itself facilitated by a distinctive aspect of Scotland's 'regulatory space'. 'Flying freeholds' were not recognized in English law until the 16th century, but the owners of flats in Scotland were recognized to hold the right to property, even in the event of the building below them burning down. However, in 1674, a major fire prompted a recognition of the unintended risk constructed by this tall, constrained urbanism. The Dean of Guild's Court was tasked to draw up Scotland's first set of building standards, which, recognizing the vertical nature of fire-spread, and the difficulty of escape from height, provided a rule that limited future construction within the city to 5 stories in height. This new legal framework was incentivized by a 17-year tax-break for land-owners who invested in new buildings.[24] It would take many years to bring the Old Town into compliance with these new standards, but the 1674 act nonetheless set the vertical limit of the contemporary city.

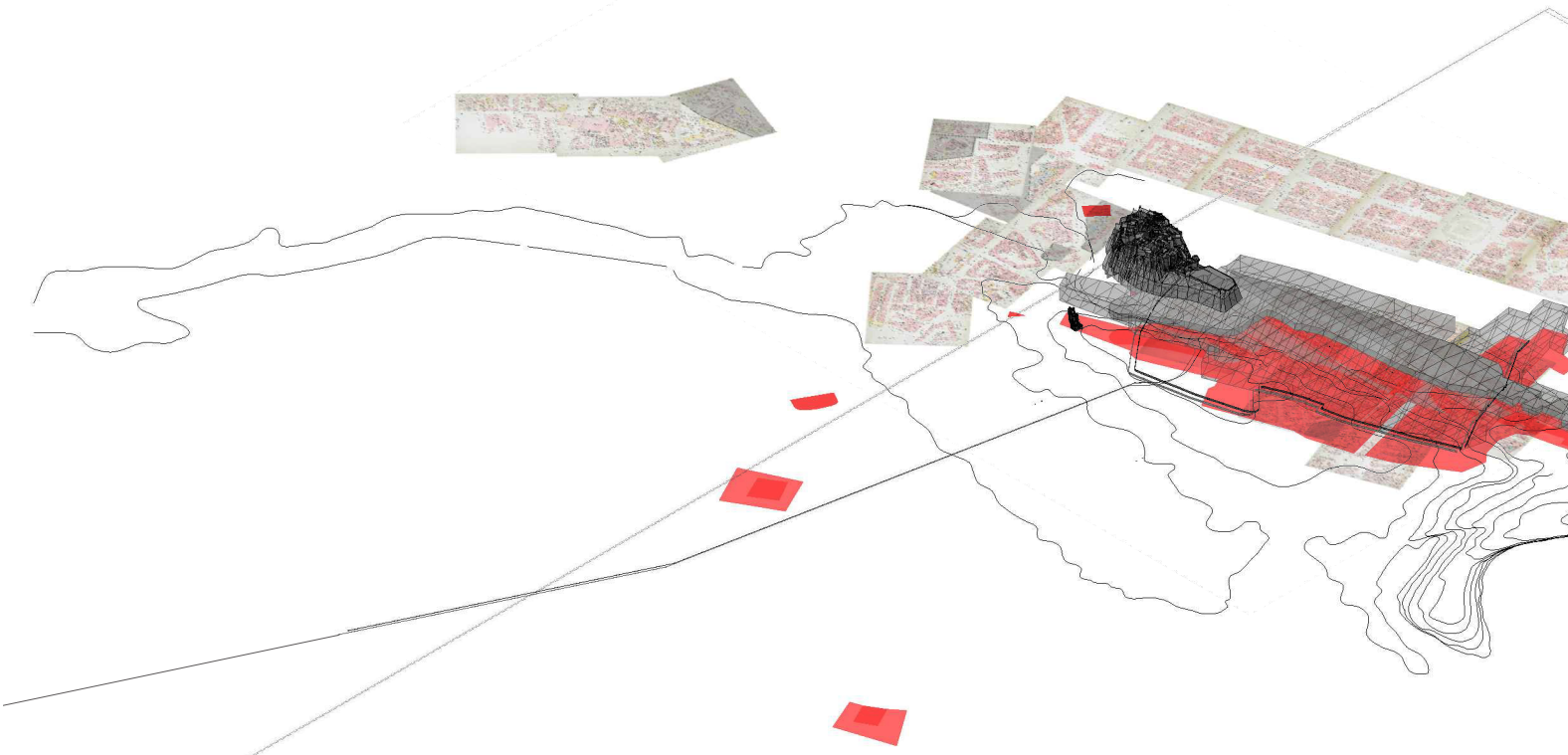
fig. 3.13
17th C. Edinburgh Plan
Liam Ross, based on Robert Kirkwood, *This Plan of the City of Edinburgh and its Environs*, 1817.

Diagram showing the city walls, its increased extent (red) and height (grey), including the new mains from Comiston, the reservoir at Castle Hill. City of Leith, and contemporary 'non-harrassment zone' figured to upper-right.

God and Goad, Providence and Insurance [fig. 3.14]

A particularly devastating fire occurred In 1703, one that engulfed Parliament Close, the Royal Exchange, the Bank of Scotland and part of the Advocates Library, driving over 200 families from their homes. The city responded by forming a municipal *Company for Quenching Fires.* The wording of the empowering Act is worth reviewing, for its tact; it suggests that while "…God in his great mercy put a stop [to the recent fire], the council judges it their duty to lay down methods, and provide means, that through the blessing of God may prove effectual for preventing the like, or greater conflagrations…". These methods and means came in the form of a company of part-time officers, provided with crowbars, axes and buckets, paid for by the common purse.

Private enterprise brigades also began to develop in Edinburgh during the 18th Century, organized by insurance companies as a means to limit the financial risk of coverage. Of course, building insurance was itself another by-product of urban fire; the founder of property insurance, Nicholas If-Jesus-Christ-Had-Not-Died-For-Thee-Thou-Hadst-Been-Damned Barbon, was an English economist and speculator who worked with Wren and Hooke on the response



to London's Great Fire. Barbon was influential in developing London's building standards – spatial codes for economic construction, taken from the ship-building trade – but also in setting up the first company to offer fire-insurance contracts, as a means to incentivise re-construction. In doing so, he invented a new form of financial service. During the 18th Century, Edinburgh would develop its own prosperous financial services sector, the UK's biggest outside London, initially through *Scottish Widows*, a mutual society set up to answer the joint concerns of supporting international trade, providing soldiers with life assurance, and underwriting property speculation against the risk of fire. This sector would go on to support the most detailed urban mapping projects undertaken to date, those of fire-insurance maps. These surveys – commonly known as Goad plans – were the first maps of urban centres to include comprehensive and standardized information about the material composition of buildings – whether they were built of flammable or inflammable materials – as well as the forms of use they supported (see fig. 3.18).

Hills and Horses [fig. 3.15]

This piecemeal and privatized system of fire-fighting came to be seen as limited, even counterproductive, during the 19th Century. Edinburgh suffered its own 'Great Fire', indeed a year of regular and severe fires, in 1824. During this year, the sight of competing

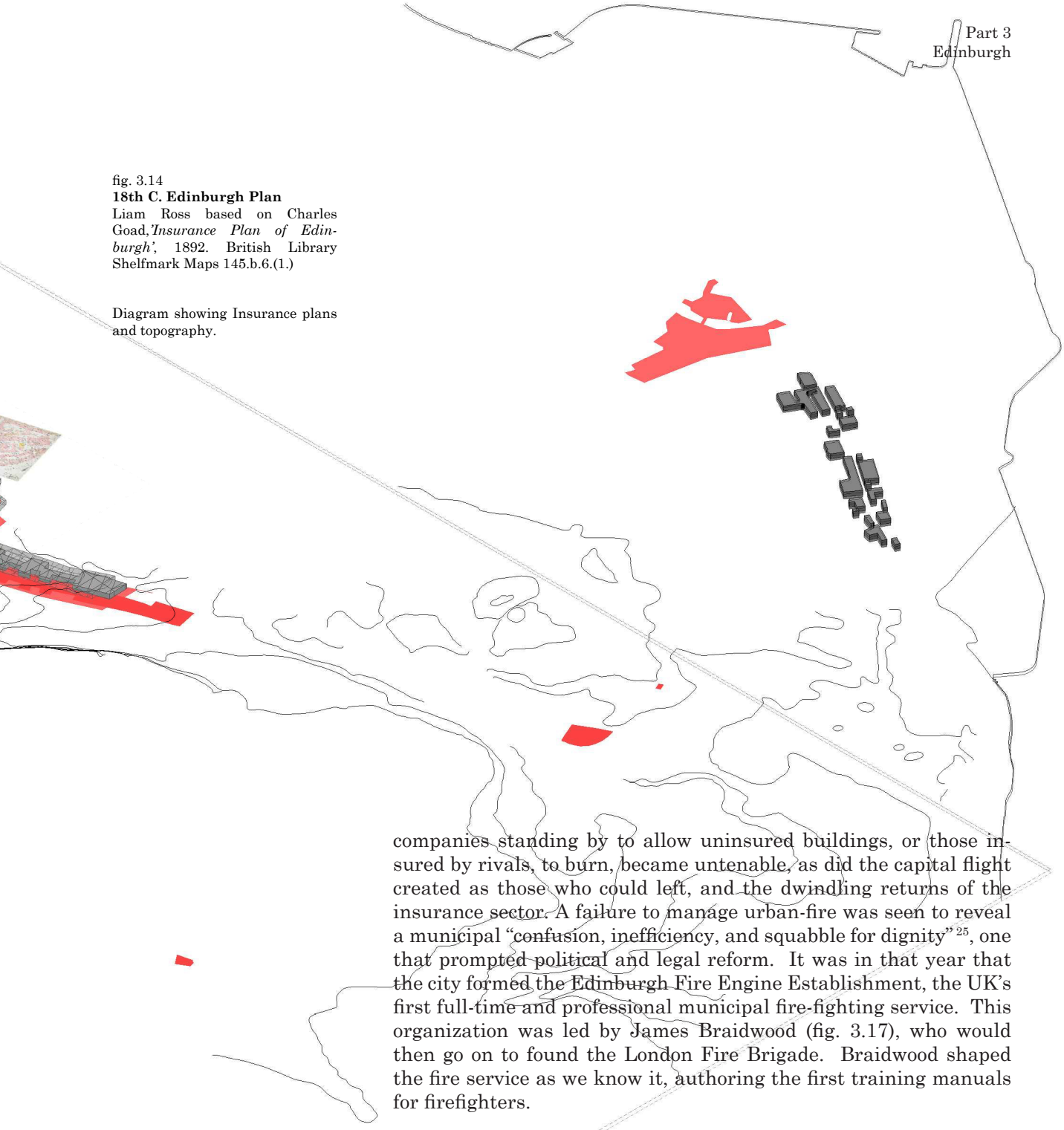
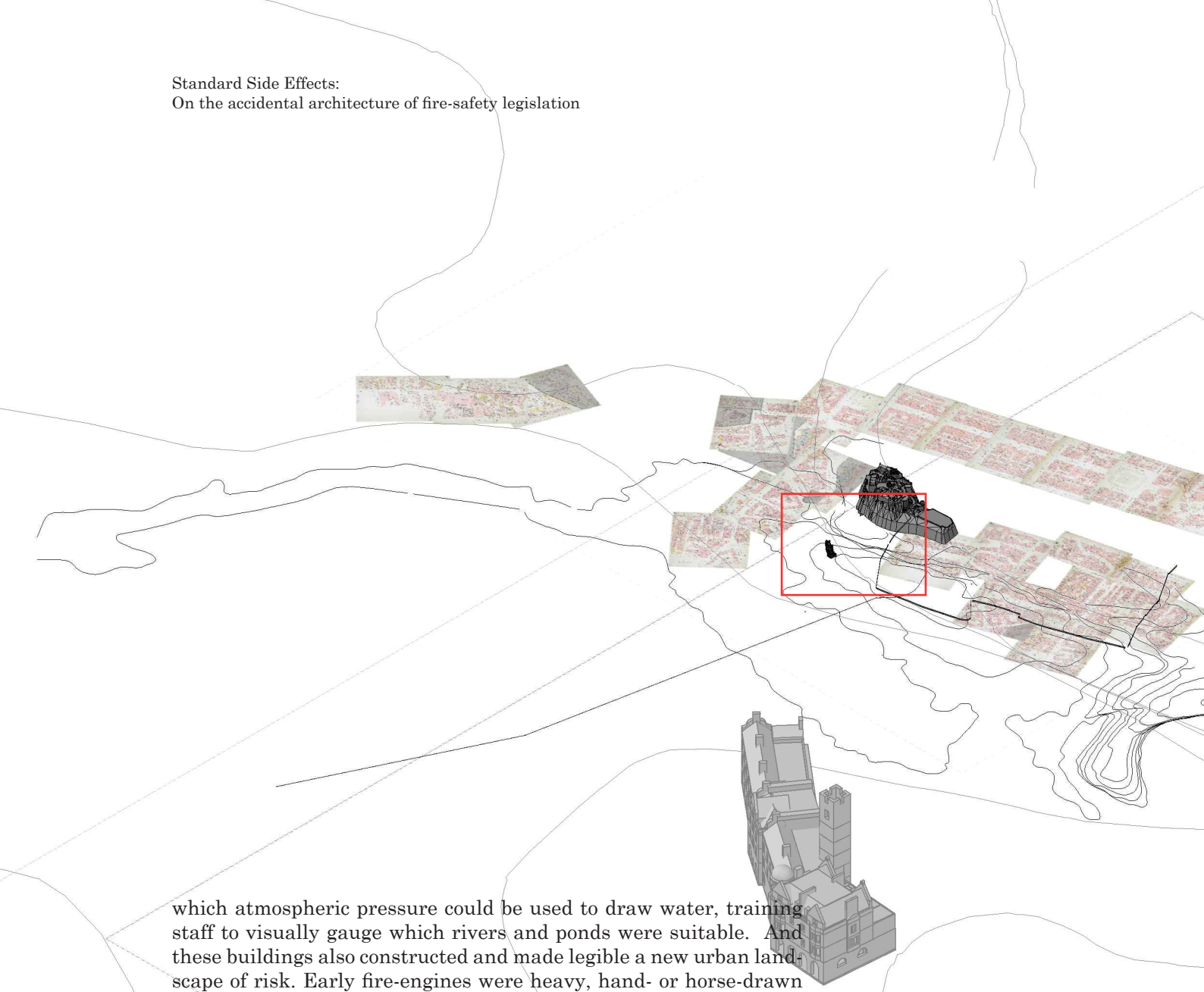


fig. 3.14
18th C. Edinburgh Plan
Liam Ross based on Charles Goad,*'Insurance Plan of Edinburgh'*, 1892. British Library Shelfmark Maps 145.b.6.(1.)

Diagram showing Insurance plans and topography.

companies standing by to allow uninsured buildings, or those insured by rivals, to burn, became untenable, as did the capital flight created as those who could left, and the dwindling returns of the insurance sector. A failure to manage urban-fire was seen to reveal a municipal "confusion, inefficiency, and squabble for dignity" [25], one that prompted political and legal reform. It was in that year that the city formed the Edinburgh Fire Engine Establishment, the UK's first full-time and professional municipal fire-fighting service. This organization was led by James Braidwood (fig. 3.17), who would then go on to found the London Fire Brigade. Braidwood shaped the fire service as we know it, authoring the first training manuals for firefighters.

Braidwood also helped to shape the physical fabric of Edinburgh, commissioning a number of stations to house the engines, horses, and live-in staff of his establishment. Under his lead, the fire-services also became involved in building permits, establishing the dimensions through which fire-risk could be understood, measured, and limited. Indeed, the physical fabric of these buildings – such as Edinburgh's Central Fire Station (inset fig. 3.15) – provides an index of this new relationship between the technologies of rescue and architectural design. Its five-storey tower, used for drying five-storey hoses, and for testing five-storey ladders, sets a visible limit to the surrounding five-storey city, both representing and ensuring their safety. Likewise, its courtyard pit indexed the maximum depth from



which atmospheric pressure could be used to draw water, training staff to visually gauge which rivers and ponds were suitable. And these buildings also constructed and made legible a new urban landscape of risk. Early fire-engines were heavy, hand- or horse-drawn 'squirts'. The difficulty of moving them reduced response-time, especially up Edinburgh's many hills. Braidwood insisted that all his stations be built on high-ground. Thus, the slow business of hauling equipment back to the station was a means of storing potential energy so as to speed later response. It is through Braidwood's success that Edinburgh can claim to be the birthplace of modern firefighting, "'the first municipality to attempt to deal seriously with the constantly recurring conflagration of the time'".[26]

World War and Social Security [fig. 3.16]

It was not until the 20th century that detailed fire-safety regulations concerning the interior arrangement of buildings were developed. We have discussed their origins already: the Empire Palace Theatre fire supported the development of a number of codes which would limit the occupant capacity of buildings, the width of doors and corridors, and the depth of floor-plates. Taken together, this history provides an outline of our contemporary standards for fire-safety: controls over the storage of hazardous material, and permitting procedures for special fire risks; controls over flammable construction

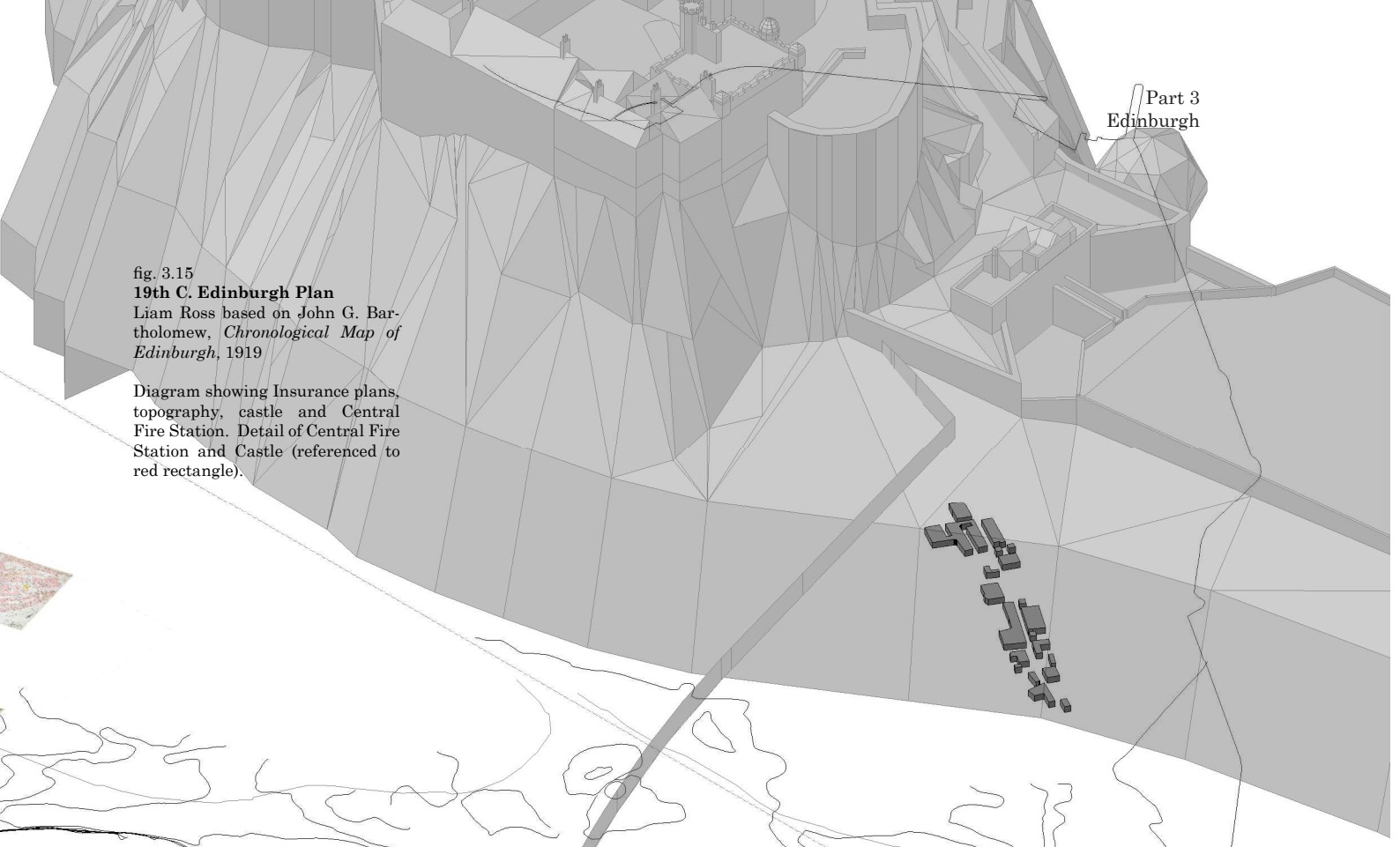


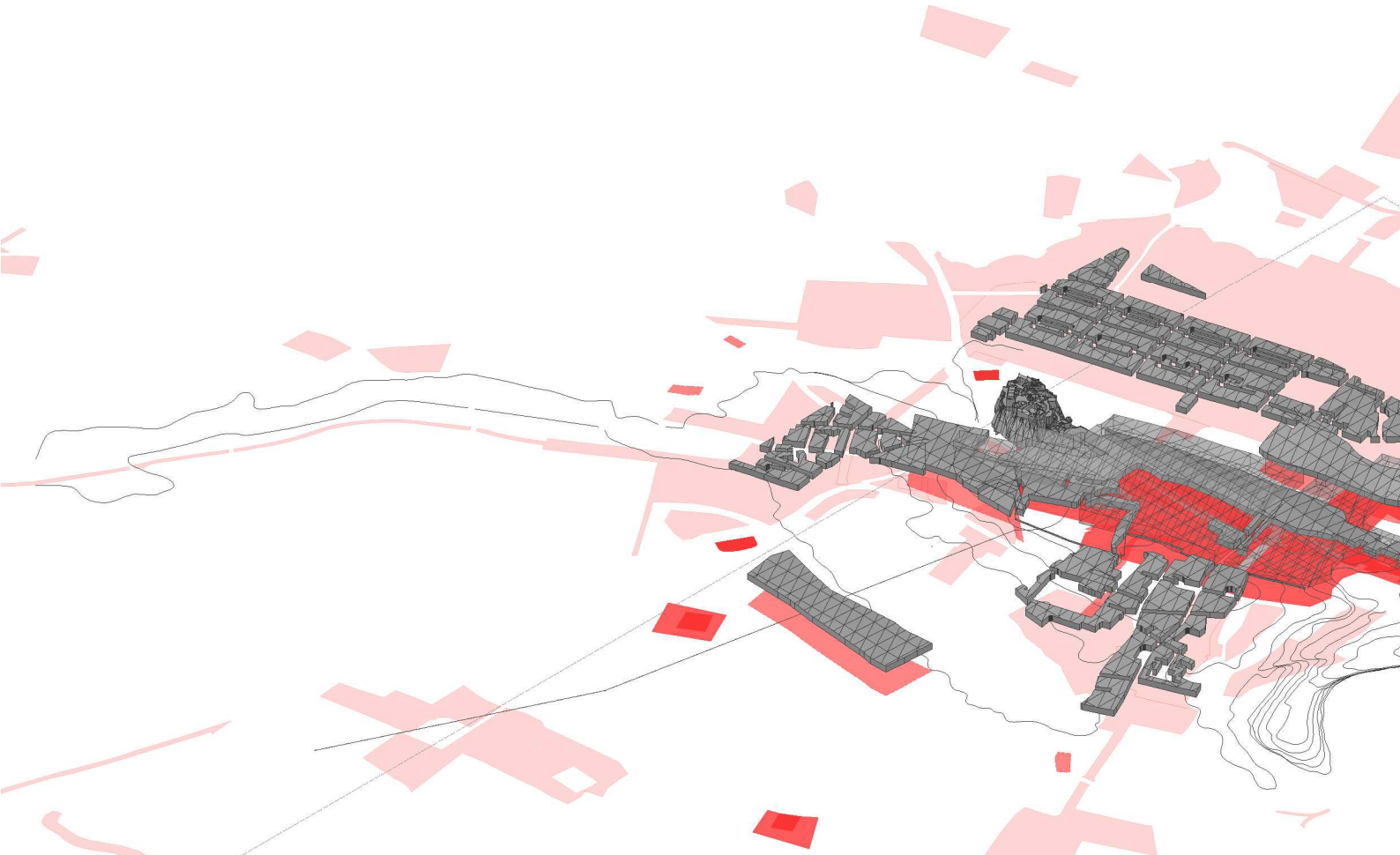
fig. 3.15
19th C. Edinburgh Plan
Liam Ross based on John G. Bartholomew, *Chronological Map of Edinburgh*, 1919

Diagram showing Insurance plans, topography, castle and Central Fire Station. Detail of Central Fire Station and Castle (referenced to red rectangle).

materials, so as to limit surface spread of flame, and limits on the combustibility of structures; the provision of piped water supplies for fire-fighting; the financial incentivisation of fire-proof construction through insurance practices; the coordination of approval processes with the fire-services; geometric limits on buildings design to ensure adequate time for escape.

That is, the governmental rationality of fire safety, and it attendant technologies, were already well defined before the creation of an Act that would fully coordinate them. It was only the exigency of World War that would bring together the existing municipal fire-fighting forces; The National Fire Service was formed in 1941, during WWII, to coordinate response to bombing as part of a national war effort. And as we described in Part 2, it was post-war reconstruction that consolidated the existing array of council by-laws, voluntary schemes, and trade agreements into a single, mandatory national building act. That is, just as the 2.5-minute rule consolidated a common experience of theatre fires, and of the national anthem, so our fire-services and fire-safety standards were amalgamated and legitimated by the common experience of war.

Governmental Genealogy



I will review the above story now, from two differing perspectives. First, I would like to read it as an episode within the process of governmentalisation, one which already highlights the way that this is shaped by its attendant technologies. The story begins with the ethics of personal responsibility proper to a pre-reformation Scotland, but also to a context of isolated small-holding. For fire to emerge as a matter of common concern would mean the construction of a situation within which its risk became contagious; this was first provided by the overlapping ownership patters, and public spaces, of the Royal Burgh. The problem of fire was first thought through the mechanisms of *Leges Burgorum*, a space of legal exceptions, constructed through selective inclusions and exclusions; in order to construct the 'freedom' of the burghers, flammable materials (and inflammatory persons) must be moved *outside*. The anomaly that makes this mentality stand out is, no doubt, its provision concerning 'common women'. The logic of that measure was that uncontrolled fires occur when men become distracted from their duties. Whatever the truth of that assumption, we can see that the mentality of this era attempted to consolidate itself by overlapping two different moral codes, two differing ideas about 'inflammation'.

The initiatives of the 17th century, by contrast, seem to broker a more nuanced relationship between the city and its exterior. By this time the city has learned that fire cannot be excluded, but must be limited at its source, and quenched, by bringing water *in*. The Im-

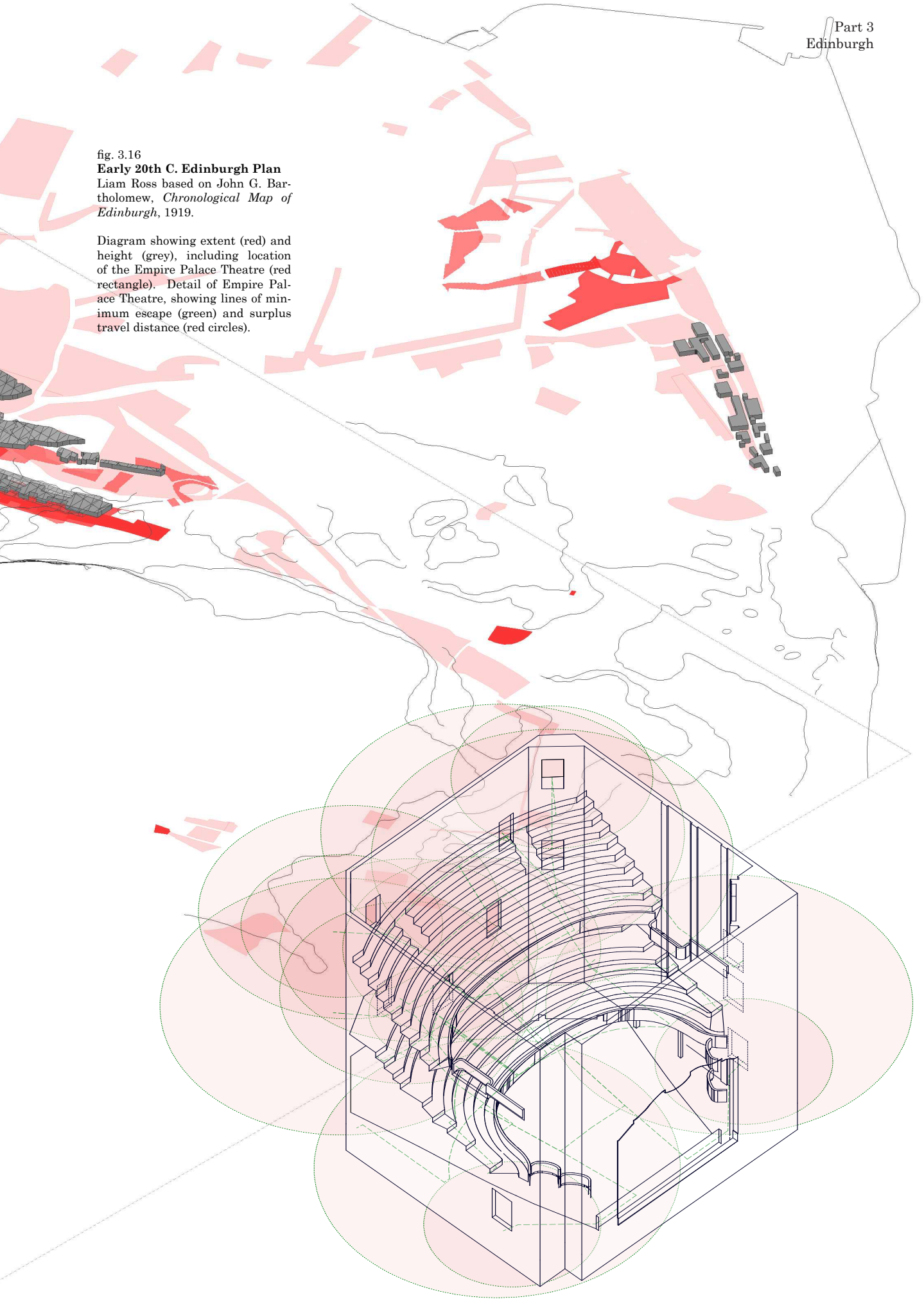


fig. 3.16
Early 20th C. Edinburgh Plan
Liam Ross based on John G. Bartholomew, *Chronological Map of Edinburgh*, 1919.

Diagram showing extent (red) and height (grey), including location of the Empire Palace Theatre (red rectangle). Detail of Empire Palace Theatre, showing lines of minimum escape (green) and surplus travel distance (red circles).

provement Acts attempt, then, to both intensify and de-densify the urban infrastructure, and in doing so begin to blur its spatial and legal extents. The source of both hazard and providence is, in this period, still ultimately beyond human ken, and so our response to it is proportionately limited.

But during the 18th century we see a change in attitude, one which is increasingly interested in predicting the likelihood of fire. Through the invention of private prudential communities, property owners could protect themselves from economic loss without preventing actual fires. This financialization of risk was supported by the standardization of material and occupancy information effected by fire-insurance maps. These maps were crucial in allowing fire-risk to be ascertained at a distance, and in the process they constructed a new means of governmental 'visibility', one which would foreshadow the concerns of both planning and building control (fig 3.18). Insurance companies would bring with them active means of preventing fires, in the form of private enterprise brigades, but also premium incentives for safe construction. To this extent, they worked as forms of economic 'responsibilisation', but only for those who chose to join these volitional communities of risk-spreading.

This model, however, could not answer to the way that fire spreads. This particular problem would therefore reinforce a need for broader, municipal, responsibility bearing authority, extending its remit to coordinate the emerging fire-fighting technologies and practices. In Edinburgh, this extension was effected by the 1824 Act. And once such an organization was in place, its logic would suggest the possibility of increasing centralization, so as to afford a socio-technical finesse of risk-mitigation. This would be achieved through the fire-services engagement in building permission, through which fire-fighting practices came to be anticipated by the built environment itself.

But for this congruence to be complete – to support an integrated system of building regulations concerning fire-safety – would require an event that nationalized that risk. World War, and the national 'war machine' would provide that event and mechanism. Through it the state expanded into a provider of social security services, national insurance, welfare and healthcare, as well as fire-services and building codes. Thought across this *longue durée*, then, we could see the problem of fire, and the technology of fire-safety legislation, as a key aspect in the construction of the 'welfare state'. That is, we can read the above story as one of a linear progression, through which fire and the city prompt an increasing imbrication of the state within logics of safety and social insurance. Concluding as we have here at the post-war moment, this tells a story of the gradual collectivization of risk; here the history of fire-safety legislation in Scotland can be read as the gradual, accidental construction of what Francois Ewald would call a 'technology of solidarity'.[27]

Reflexive Limitations

If this story is in danger of sounding teleological, I can only say that later chapters within this dissertation offer evidence to the contrary. However, bracketed within this temporal and spatial frame, my purpose here is not to pick apart this particular narrative. What I do wish to consider in more detail, though, is the role that space, or the design of the built environment, plays in this series of transformations. This brief history has been enough to demonstrate that it is the city that *constructs* the problem of fire; the city is the catalyst of fire, and so for the programmes of building legislation and urban improvement that come in its wake. This story has also shown that these improvement have not always hit the mark; fire is a *recurrent* problem, one that keeps returning, despite our attempts to suppress it. And finally it has shown that, when fire returns, and returns to a city that *anticipates* it, it returns in a novel form, a form that has been shaped by that anticipation. I would therefore like to offer a second review of the above story, one that seeks to pick out from this linear development a series of moments in which fire-safety legislation constructs its own accidental effects, and in so doing, engages in a process of reflexive self-limitation.

The original accident in this story is that of the city itself; the risk of uncontrolled fire that is constructed by dense settlements, and ambiguities of responsibility and ownership. This risk is complicated, at the very moment it is discovered, when James I attempts to quench the passions aroused by 'common women' at the same time as the fires they are purported to cause. The regulatory space of the Scotland Act has a contemporary resonance with Edinburgh's 'non-harassment zones' for sex workers. Both lump prostitutes into the same unfortunate spatio-legal category as edge-of-town storage facilities. Non-harassment zones create spaces of 'tolerance' within which soliciting is permitted, spaces which in Edinburgh today coincide with the peri-urban sites of big-box stores, and self-storage warehouses. This coincidence is not accidental; in both cases the problem is understood as one of proxemics; in the case of fire, prostitution and shed retail, risk and controversy is stoked by proximity. To limit this, dense co-habitation must find within itself a loose zone, through which spatial dissipation can make the presence of outsiders more tolerable.

Another moment of self-limitation is described between the Scotland Act and later improvement bills. Where the former depended upon a conception of Law and the City as fundamentally *bounded*, by the 17th century, this boundary was seen as the root of the problem. The prevalence of fire was growing along with the skyline, hay, or no hay. The Improvement acts, then, recognize the limits of the Scottish Act, and propose a contrasting approach; an attempt to define the edge of the city (and so of law, and its exception) must give way to a more expansive urbanization. As such, the distinction between Royal and Baronial jurisdictions, and between the Burgh

and its surrounding landscape become intentionally blurred.

That the modes of fire-prevention developed during the 18th century were not wholly successful evidences a reflexive limitation *within* their mentality. Edinburgh's high level of flammability created certain benefits, supporting its growth as a centre for financial technologies, which continue today to be one of its most significant employers[28]. That insurance does not necessarily reduce prevalence does not stop it from being 'profitable', as long as premiums cover outlays. Through the logic of insurance, a fire within your building, or within a building insured by a rival company, might be advantageous. The potentially vicious circle that this logic suggests, however, reached its own limit through the events and innovations of 1824, when (just as in 2008) the need for a higher tier of authority, a 'lender of last resort' became apparent.

A final set of reflexive effects can also be seen within the fire-prevention thinking of the 19th century. On the one hand, the technologies of fire-rescue reframed the physical contours of the city in terms of a gradient of risk located on top of hills more prone to catastrophic fire. However, at the same time, these gradients were enrolled within the technologies of rescue, creating a complex weave of more-or-less natural and constructed risks. Being at the top of a hill wasn't bad, as long as it was a hill with a fire-station on it.

An Archaeology of Accidents

What I have tried to describe through this second review of our Scottish building standards, as I did with the 2.5-minute rule, is the way that govern-mentalities are transformed as they are translated into the built environment. That is, what I want to suggest is that our regulatory frameworks for fire-safety are characterized less by a coherent set of 'discursive regularities'; rather by the aggregate effect of accident. To be clear; what I do not mean to do is ignore the dedicated and purposive action undertaken by many different people, and animals, over the long period recounted, and their contribution to real reductions in the prevalence and severity of urban fire. Neither do I only mean to state what is obvious; that the legacy they have left in the form of our legal frameworks is shaped by the unfortunate events that they respond to. Rather, what I have tried to show is that the collective effect of those frameworks is shaped, across history, by the unintended consequences of legislation itself, by the sometimes beneficial, sometime detrimental side-effects that occur in the course of regulating building. In section 2.3 these side-effects as moments of 'infrastructure inversion', moments of surprise in which the ground we take for granted stands out in obstinate relief; the story recounted above turned around four such moments; the moment in which dense co-location became a risk rather than a benefit; when the city walls came exacerbate rather than mitigate risk; when loss was recognized as a kind of gain; when

fig. 3.17
Statue of James Braidwood
Photo credit: Liam Ross

Parliament Square, Edinburgh.

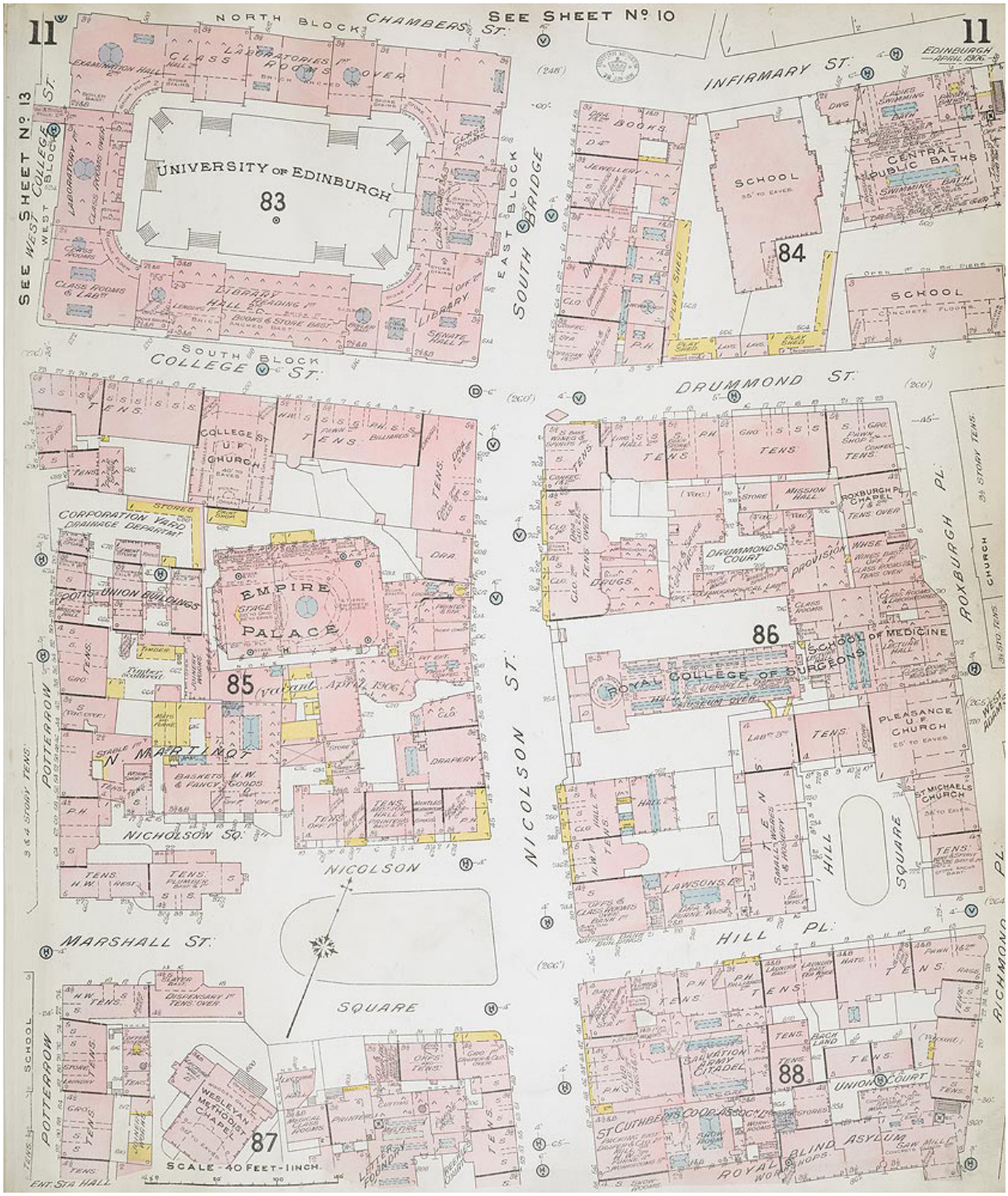

11
NORTH BLOCK
CHAMBERS ST.
SEE SHEET Nº 10
11
EDINBURGH
APRIL 1906
INFIRMARY ST.
SEE SHEET Nº 13
WEST COLLEGE BLOCK
UNIVERSITY OF EDINBURGH
83
EAST BLOCK
SOUTH BRIDGE
SCHOOL
84
CENTRAL PUBLIC BATHS
SCHOOL
SOUTH BLOCK
COLLEGE ST.
DRUMMOND ST.
COLLEGE ST. U.F. CHURCH
CORPORATION YARD
DRAINAGE DEPARTMENT
EMPIRE PALACE
85
(vacant April 1906)
POTTERROW
POTTS UNION BUILDINGS
NICHOLSON SQ.
NICOLSON
NICOLSON ST.
ROXBURGH PL.
DRUMMOND ST. COURT
MISSION HALL
ROXBURGH PL. CHAPEL
86
SCHOOL OF MEDICINE
ROYAL COLLEGE OF SURGEONS
PLEASANCE U.F. CHURCH
ST MICHAELS CHURCH
HILL PL.
SQUARE
MARSHALL ST.
SQUARE
WESLEYAN METHODIST CHAPEL
87
SCALE - 40 FEET - 1 INCH.
SALVATION ARMY CITADEL
88
UNION COURT
ST CUTHBERTS CO-OP. ASSOC. LTD.
ROYAL BLIND ASYLUM
POTTERROW
SCHOOL

fig. 3.18
"Insurance Plan of Edinburgh, Sheet 11"

1911, Charles E. Goad. The British Library, Shelfmark Maps 145.b.6.(1.)

Pink denotes non-flammable construction material (typically stone); yellow denotes flammable construction materials (typically timer); grey denotes unprotected openings (typically skylights); firepoints denotes on streets with a 'V'; italicised text denotes building occupancy type.

a hill became an affordance as well as a hazard. I have taken the time to relate these moments, to suggest that they illustrate the way that govern-mentalities change, confronted by side-effects that they can either make use of, or not.

We know that Aristotle sought to distinguished between the 'essential' and 'accidental' characteristics of things; a sculpture might have teeth, or no teeth, but still be the Venus of Milo. We see something akin to this ambition within processes of building standardization; from the mess of contingent misfortunes that occur within our buildings and cities, we attempt to discern between the 'accident' and the essential thing to be learned from it; combustibility, special risks, eaves height, clearance time, exit width. But history can seem unkind to this ambition; what appears essential at one moment can looks accidental the next, as different and differently consequential characteristics of the built environment come to stand out. Like John Wilkins, and his secret encyclopaedia, we don't narrow down on the essence of things; the inclination of a flight of stairs, the size of a human body, and the movement of the stars do not suggest a common denominator. Rather, what we find is an ever-increasing list of contingencies; straw, the location of a prostitute's house, the length of a ladder or a stretch of hose, a profit margin, the top of a hill, the length of a piece of music, the width of someone's shoulder. Despite refining our tools of governmental visibility, we seem to miss the thing itself, seeing only a halo of accidental predicates that surround them. As such, we can speak of a building in 1426, or in 2017, as if we speak about the same thing, despite its having been thoroughly transformed.

But this combination of flexibility and stability is precisely what Susan Leigh Star recognized within the 'Boundary Object'. The value of such 'objects' is that they can be recognized as the same thing by a variety of actors, actors who nonetheless see in that thing a host of different concerns. Intentionally or otherwise, I wish to suggest that the governmental infrastructure of building standards reveals the an-essential quality of the built environment, they construct, discursively and materially, a manifold thing,[29] the result of a compound accident. That is, governmentality can seem to suggest, in terms of our everyday experience, a process through which things get ever more standardized, circumscribed by calculative practices. But there is, at the same time, and equally prevalent counter-movement, one in which the rationality of government is confronted by, resisted and redirected by, the profuse, contingent and an-essential dimensions of things.

3.3
The Texture of Travel Distance

I will close this first case study by returning to the regulation of travel distance, to consider the question of accident from another perspective. The previous sections have been retrospective in outlook, but here I wish to consider standards as *projective* devices. In doing so, I hope to explore the *texture* of that particular standard, to study the way that travel distance codes warp architectural design in ways only evident to those who work closely with them.

Yin and Yang, Communism and Capitalism

This reflection was prompted by another moment of infrastructure inversion, one that occurred during a workshop on the sociology of fire, sponsored by the Lloyds Register Educational Trust. The topic for discussion was the different way that experts in varied fields made use of fire safety knowledge. One of the speakers was a representative from Pelli Clarke Pelli Associates, the global architectural consultancy founded by the Argentine-American Cesar Pelli, one-time Dean of the Yale school of architecture. The delegate presented a design for a 400m tall tower, part of a scheme for the Xiaobailou Union Plaza in Tianjin, China. The building will rank as one of the tallest in the world when completed, being 2m taller than the Petronas Towers, completed by the same firm, which held that title until 2004. The Petronas towers are famous, in part, for their innovative fire-escape strategy; a sky-bridge on the 41st and 42nd floors allows evacuation through the adjacent twin[30]. The design of Xiaobailou Union Plaza Tower 1 was likewise informed by egress requirements. The shape of the building is determined by its plan, two circular floor-plates, gathered around a structural cores that converges as its rises; the floor-plates merging from a figure-of-eight at the base to a circle at its peak. This form was presented to the client as a representation of Yin Yang, intended here to symbolise the happy co-existence of Communism and Capitalism. However, we were told, it was in fact determined by travel distance codes; building to the maximum permissible area allowed by BS999 created two centroidal floor-plates centred on their means of escape (fig. 3.19).

fig. 3.19
Xiaobailou Union Plaza Tower
Pelli Clarke Pelli Architects, 2009 (proposed), Tianjin, China. Source: skyscrapercenter.com

This presentation was met with laughter, laughter that then provoked anger: the attendant fire-safety engineers took this occasion, which was its purpose, to relate the ambiguities, redundancies and deficiencies of our travel distance codes, deficiencies which frustrated the architect that had unwittingly constructed an edifice around them. We have discussed the humour and frustration of this circumstance at some length, and I do not wish to dwell upon them further here. But in this unlikely example, I think, we are offered an object lesson in the role that architecture plays within processes of regulatory governance. What strikes me of particular interest here is that, while designing a building around the travel distance codes, these nonetheless had to be made to look like something else. The work of Pelli Clarke Pelli demonstrates the fact that fire-safety is an important shaping factor for the design of high-rise buildings, but it is an unlikely source of inspiration; to appear in public it must enlist the services of an innocuous metaphor. We are familiar with something akin to this strategy - one of plot maximisation - from the work of Koolhaas or MVRDV, practices who appear more innovative because they are in on their own gags, understanding the irony of self-conscious compliance. Pelli Clarke Pelli's strategy is different, more normal; it involves disguising one rationale as another. Through this – much more conventional – architectural strategy, they provide an important role; they keep the subliminal subliminal. That is, while building a concern for fire-safety 'into the woodwork', they nonetheless implicate it within other concerns, and allow it to generate collateral affects. Here the shape of a floor-plate provides the materially consistent but discursively flexible object through which an actor network is formed.

The Shape of the British National Anthem

The coexistence brokered by Xiaobailou Union Plaza Tower 1 is accidental, but not arbitrary; it is steered by and reveals a particular 'texture' of travel distance codes, the building being warped by a spatiality embedded within them. Limitations on travel distance, whether enforced by SBSA 2.9.3, or BS999, are suggestive of a circular plan configurations. Travel distance is measured by a line, originating at a point (the protected door), and describing a circumference. The size of that circle depends upon the occupancy profile; the presumed speed at which the people within the floor make their way to that point. This circle can never be perfect, however, because in reality a protected door is not simply a point; it must give access to a vertical circulation core, a core which itself becomes an obstacle to horizontal movement. Maximum permissible floor-plates pucker around their core, as does the cross-section of an apple. The size of the core, and the location of the door within it (fig. 3.21) determine the curvature and origin of that pucker. The resultant geometry achieves a baroque complexity where two directions of escape are possible. Here the circumference describes a series of inflections, which originate from the distance that an escapee can travel in one direction, prior to deciding which way to go (fig. 3.22). A building

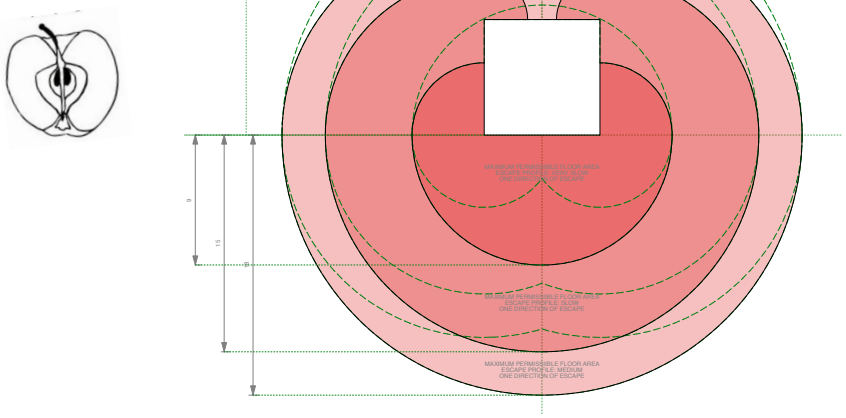


fig. 3.20
Longitudinal Section of an Apple
Source: http://fruitandnuteducation.ucdavis.edu

The surface of an apple, which tends towards being spherical, puckers around its core.

fig. 3.21
Maximum permissible floor areas for varied occupancy profiles with 1 means of escape.
Drawing: Liam Ross

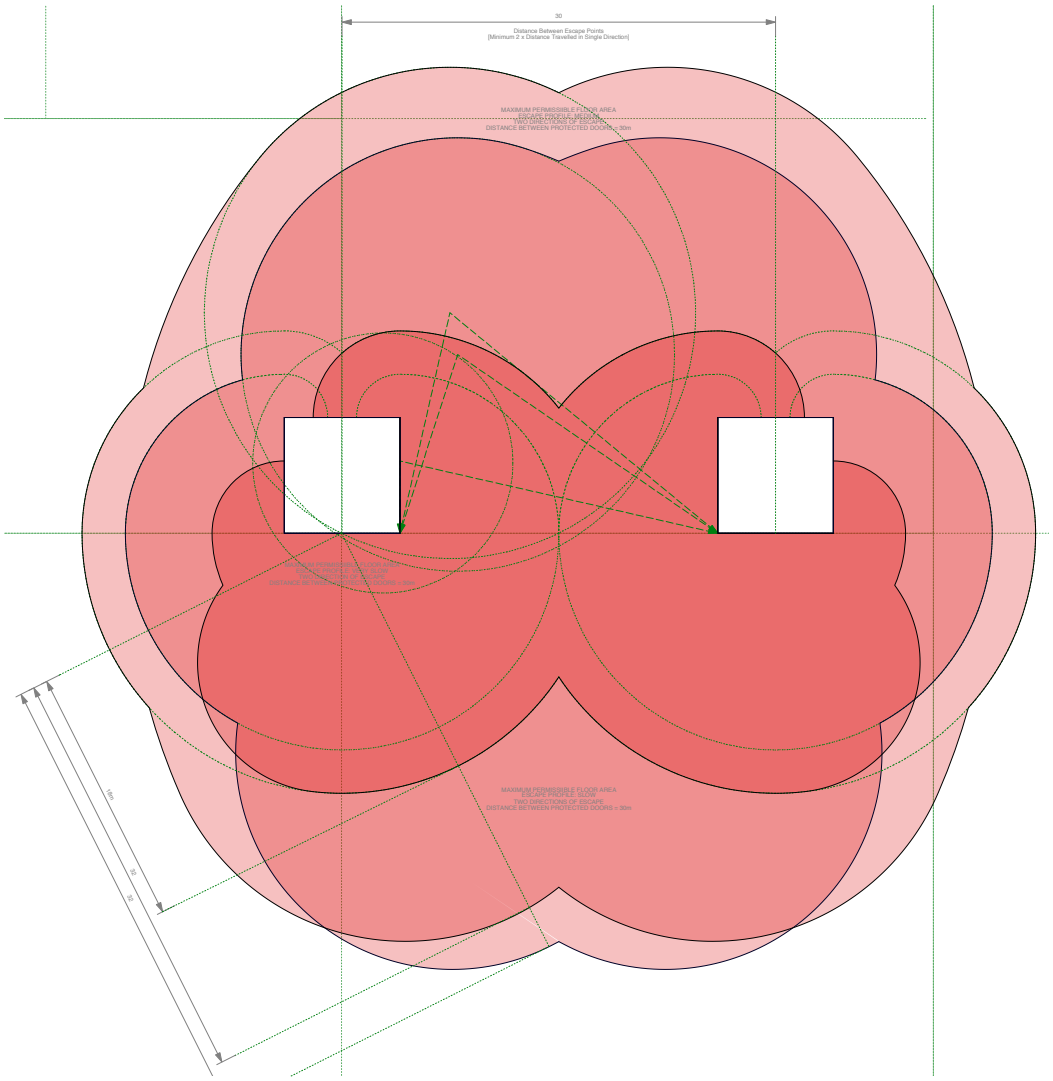
fig. 3.22
Maximum permissible floor areas for varied occupancy profiles with 2 means of escape.
Drawing: Liam Ross

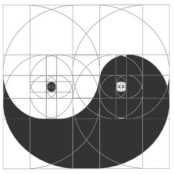
fig. 3.23
Construction Yin Yang
Shawn Remy. Accessed 21 August 2018. https://www.youtube.com/watch?v=A5fdji5qLJQ.

The traditional symbol of Yin yang is constructed from radii originating at two displaced nodes, encompassed by a third radii, originating at the midpoint of a line drawn between those two points. This geometric construction is very similar to the geometric construction of maximum permissible floor areas.

whose escape core does not stack directly, but converges or diverges, tests the dynamic range of these related parameters.

There are no diagrams within BS999 or SBS 2.9.3 that demonstrate these spatial consequences. Earlier methods of limiting travel distance (there are guidelines within the *Post War Building Studies*) define X and Y vectors, presuming and reinforcing a rectilinearity of plan[31]. However, through the looser requirements of BS999, something is discovered. Within the parametric variations permitted, one formality remains constant; the perimeter of the maximum permissible floorplate will always be perpendicular to the most direct route of escape. Or to put this experientially; for an occupant facing *out* of such a building, the most efficient line of escape would always be directly behind them. On this basis, I think it is possible to argue that the Xiaobailou Union Plaza Tower 1 *does* offer an innovation in architectural fire-safety, not because it complies with the codes, but rather because it discovers within them an accidental architecture, one which suggests a form of tacit wayfinding for fire-safety. This spatial logic was in no way present within the model for the code, the Empire Palace. In that building, the risk was in the centre, and the means of escape at the perimeter. However, the logic of the code does resonate clearly with the structural logic of a skyscraper, based as it is upon a central structural and circulation core. None of these implications were anticipated by the regulators; the way that this code intersects with other shaping concerns in the built





environment only emerges through its application. That the radii of permissible travel distance might trace out the Yin/Yang symbol and offer a ready metaphor to ameliorate the political contradictions of for-profit development within a nominally communist regime, is something that only becomes obvious on an architects drawing board. Nonetheless, what I want to suggest is that it is through such accidental congruences, through their becoming enmeshed with other problems and actors, that a concern for egress is held together, and its anthropological fullness is reconstituted.

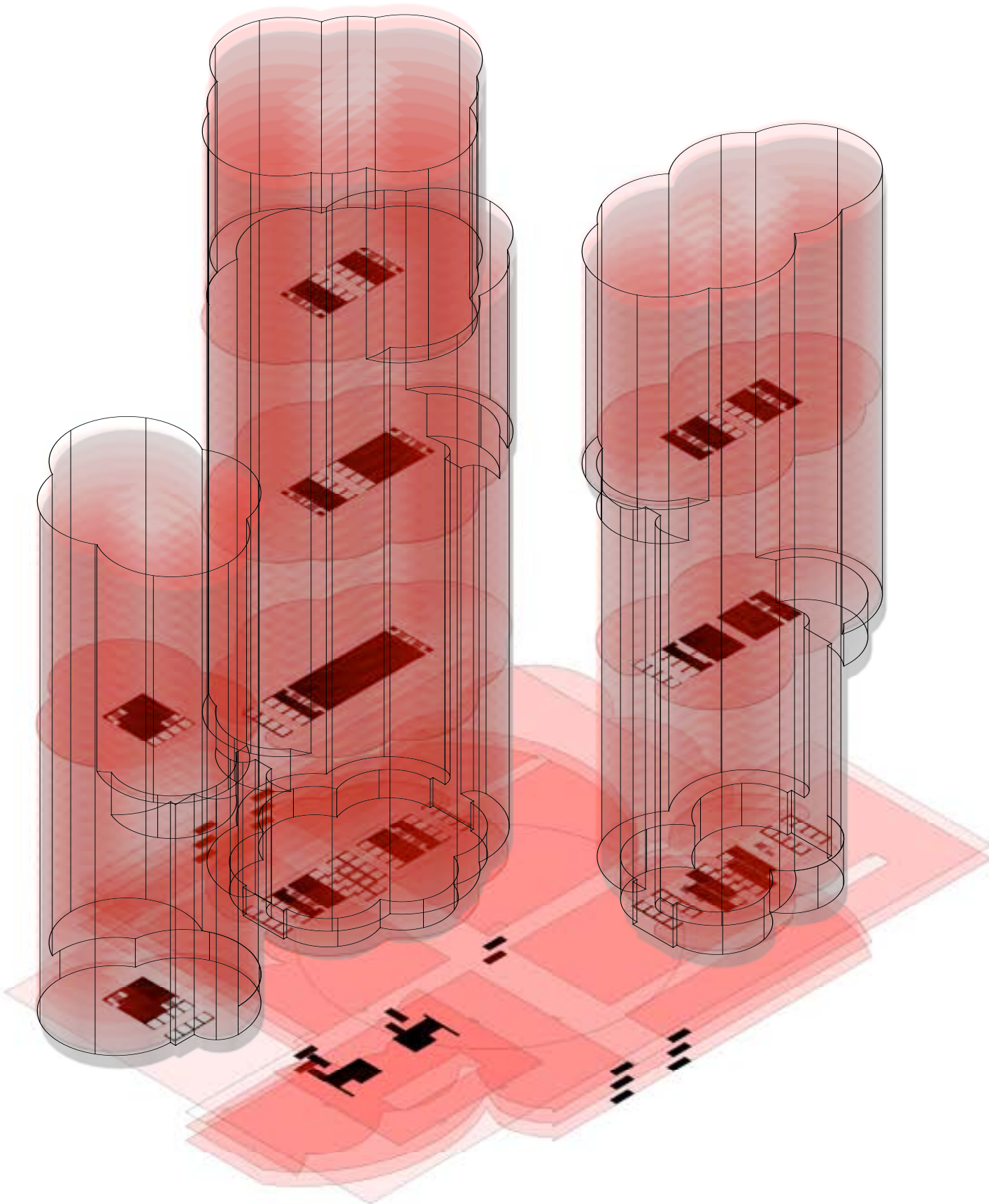


fig. 3.24
Retrospective Proposal for the Toronto Dominion Centre
Drawing: Liam Ross

Note on Folio 2

The above analysis was supported in its development through two by-design analyses. These are presented in Folio 2, alongside a further project which extends the analytic methodology speculatively. Folio 2.1 supports section 3.2 above. It presents a series of historical surveys of Edinburgh, produced to illustrate the way in which Scottish fire safety legislation reverberates with, and is inscribed into, the built fabric of that city. Folio 2.2 supports section 3.3 above. It documents the diagrammatic analysis of Scottish Building Standard 2.9.3 Travel Distance, and the accidental architecture that it generates. Folio 2.3 presents a speculative design project based upon this methodology, 'Retrospective proposal for the Toronto Dominion Centre'. This project explores the generative potential of travel distance for architectural design, and in doing so suggests a further series of accidental congruences between egress, structural stability, day-lighting, and the spatiality of modern architecture. This exercise begins by analysing the maximum permissible floor-plate of Mies Van der Rohe's Toronto Dominion Centre. The circulation core of this project – a conscious attempt to develop a generic language for the high-rise corporate tower – is taken as an empirical given; the analysis demonstrates which parts of that existing building fall foul of current travel distance standards, as well as parts of the plan that could be extended. This reveals a series of humorous anomalies. The Toronto Dominion centre elevator and stair core, in common with most high-rise buildings, reduce in size as they rise, as staggered elevators to lower floor-clusters terminate. This has the counterintuitive effect of allowing the upper floors to be larger, no longer limited by the obstacle this core poses to horizontal circulation. Here logics of escape work against those of structure; a high-rise building that sought to maximise permissible floor area would logically increase in depth as it rose. Likewise, this suggests a divergence, even an inversion, from conventions of urban daylighting, as they are expressed, for instance, through step-back codes. That is, this study seems to offer an accidental critique of the original building, in two ways. Firstly, the circular logic of the proposal stands in stark contrast to the isotropic character of Mies' architecture, creating a clear spatial dialectic. Wherever you are within this revised Dominion Plaza, you know whether you are inside or out, at risk, or safe. Likewise, where Mies sought to 'free' a modern architectural vocabulary – through the Seagram Building, and its later repetitions - from the Baroque variations constructed by New York's step-back rule, here they return to haunt it in inverted form. While the design process used here emulates those of Hugh Ferris' famous studies, this legal diagram appears as classic step-back skyscraper, turned on its head.

(Endnotes)

1 Original newsreel reports on the fire are available within the National Library of Scotlands moving image archive: 'Full Record for "THEATRE FIRE IN EDINBURGH" (1607) - Moving Image Archive Catalogue', accessed 8 November 2017, https://movingimage.nls.uk/film/1607.

2 British Fire Prevention Committee, *Redbooks of the British Fire Prevention Committee*, 1911.

3 Newsreel footage of the funeral procession is also available in the NLS archive: 'Full Record for "FUNERAL OF THE GREAT LAFAYETTE, EDINBURGH" (1620) - Moving Image Archive Catalogue', accessed 8 November 2017, https://movingimage.nls.uk/film/1620.

4 My thanks to the Edinburgh Festival Theatre for discussing this even with me, and sharing their own material on this event.

5 Lewis Hamilton, the British Formula 1 racer, is concerned about the short length of the tune. "One verse of the God Save the Queen was played in under 44 seconds, ignoring two other verses and one unofficial verse. That isn't enough for Hamilton. 'It's like, is that it?' he grumbled in a radio interview after winning [the German Grand Prix]. He wants it to be longer, in the interest of fairness. 'When I'm standing there and it is Felipe's [Massa] one it's like 10 minutes long'. That's a little exaggerated - when Massa won the Bahrain F1 in 2008 he was up on the podium for one minute 58 seconds but only 55 seconds of that was the Brazilian national anthem. It then melded into the Italian national anthem, for his team, Ferrari." Clare Spencer Rowlatt Justin, 'Is the British National Anthem Too Short?', *BBC News*, 27 July 2011, sec. Magazine, http://www.bbc.co.uk/news/magazine-14305875.

6 Joint Committee on Fire Grading of Buildings, *Fire Grading of Buildings* (H.M.S.O, 1952). p. 78

7 Joint Committee on Fire Grading of Buildings. p. 79

8 'BS 9999:2008 - Code of Practice for Fire Safety in the Design, Management and Use of Buildings – BSI British Standards', accessed 8 September 2015, http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030158436.

9 St Andrew's House Scottish Government, 'Technical Guidance', Website Section, 2 March 2009, http://www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/publications/pubtech.

10 Personal correspondence with a variety of fire-safety experts has suggested differing explanations for this discrepancy.

11 Luke Bisby is a colleague of the authors, a co-participant in the University of Edinburgh's teaching/research project ITSAFE (Integrating Technical and Sociological Aspects of Fire Safety Expertise). My thanks to Luke for extensive opportunities for personal correspondence that have supported this research enquiry. Nick Collins, 'Professor of Fire: Safety

Laws “Absurd”’, 22 October 2013, sec. News, http://www.telegraph.co.uk/news/science/science-news/10393435/Professor-of-Fire-safety-laws-absurd.html.

12 Quoting Colin Todd from an online forum discussion on the derivation of exit width standards. See ‘BS 9999 Exit Flow Rates’, accessed 7 November 2017, http://www.crisis-response.com/forum/index.php?topic=6578.5;wap2.

13 Evidence of this early association is recorded again, by *Gentleman’s Magazine,* in its October 1836 edition. Its notes an “additional verse... though being of temporary application only... stored in the memory of an old friend... who was born in the very year 1745, and was thus the associate of those who heard it first sung”. Needless to say, in the context of union once again dissolving, its inclusion today would be inadmissible: “Lord, grant that Marshal Wade; May by thy mighty aid; Victory bring; May he sedition hush; and like a torrent rush; Rebellious Scots to crush; God save the King.”

14 I mean here to evoke two mythical analogies for the origins of Art, and its relationship to loss, and the work of mourning; Pliny the Elder’s story illustrated by Karl Friedrich Schinkel’s 1830 painting ‘The Origin of Drawing’, and the myth of Orpheus. For compelling interpretations of these sources, see Evans and Blanchot. Robin Evans, The Projective Cast: Architecture and Its Three Geometrics, New Ed edition (Cambridge, Mass.: MIT Press, 2000). Maurice Blanchot, The Gaze of Orpheus, ed. P. Adams Sitney, First edition edition (Barrytown, N.Y: Barrytown/Station Hill, 2000).

15 I mean here specifically the significance of Jeremy Bentham’s *Panopticon* – itself a device of ‘liberalism’ - both for Foucault’s political philosophy, but also for Wallenstein’s architectural theory. See Jeremy Bentham, The Panopticon Writings, Second Edition edition (London; New York: Verso, 2011). Michel Foucault and Alan Sheridan, Discipline and Punish: The Birth of the Prison, New Ed edition (London: Penguin, 1991). Sven-Olov Wallenstein, Bio-Politics and the Emergence of Modern Architecture, 1st ed. (Princeton Architectural Press, 2009).

16 Leigh Hancher and Michael Moran, Capitalism, Culture, and Economic Regulation (Oxford England : New York: OUP Oxford, 1989).

17 I spoke to Mick Moran on the phone regarding this point; he noted that – at the time of writing – he was not aware of Foucault’s concept of ‘governmentality’, as it had not yet been translated into English. Nonetheless, he concurred that aspects of his own concerns resonate with that literature.

18 The verb ‘to regulate’ comes into English language through the Middle French *regler* - to control, order, regulate, govern, to mark with lines drawn with a ruler – having a close relation to the contemporary *ruiller* - to preside over, decide, determine, decree, and to mark out, specifically in senses relating to building.

19 I am paraphrasing McDermont who extends the ‘regulatory space’ literature by bringing the concept into dialogue with thinkers such as Lefevbre, Foucault and Latour Morag McDermont, ‘Territorializing Regulation: A Case Study of “Social Housing” in England’, *Law & Social Inquiry* 32, no. 2 (1 June 2007): 373–98, https://doi.org/10.1111/j.1747-4469.2007.00063.x..

20 I would like to thank Catherine Ingraham for this observation.

21 This summary of Scottish fire-safety legislation is taken primarily from the a publication developed by the Lothian & Borders Fire Rescue Services: See Alexander Reid, *'Aye Ready!': History of the Edinburgh Fire Brigade, the Oldest Municipal Brigade in Britain* (Edinburgh: [South-Eastern Fire Brigade], 1974).

22 James 1, 11 March 1426, Perth, Parliament, Legislation, in 'Records of the Parliaments of Scotland', accessed 14 October 2014, http://www.rps.ac.uk/static/bottom_frame.html.

23 'Edinburgh-Royal Mile Old Town and New Town', accessed 12 June 2018, http://www.royal-mile.com/history/oldtown-modern.html.

24 Ian D. Whyte, *Scotland Before the Industrial Revolution: An Economic and Social History C.1050-c. 1750* (Routledge, 2014).

25 S. Ewen, *Fighting Fires: Creating the British Fire Service, 1800–1978* (Springer, 2009).

26 Quoting Blackstone in Ewen., p. 38

27 François Ewald, *L'Etat providence* (Paris: B. Grasset, 1986).

28 Goad's maps were recently acquired by Experian, see http://www.experian.co.uk/goad/goad-plans.html

29 I am attempting here to bring together the 'object' of Susan Leigh Star's sociology with Bruno Latours expansion of Heidegger's 'Thing'. In attempting to blur the distinction between Heidegger's 'Object' and 'Thing', Latour uses an accident – the challenger disaster – to describe the moment that technical objects demonstrate their, an-essential character: "Here, suddenly, in a stroke, an object had become a thing, a matter of fact was considered as a matter of great concern. If a thing is a gathering, as Heidegger says, how striking to see how it can suddenly disband. If the "thinging of the thing" is a gathering that always connects the "united four, earth and sky, divinities and mortals, in the simple onefold of their self-unified fourfold," how could there be a better example of this making and unmaking than this catastrophe unfolding all its thousands of folds" Bruno Latour, 'Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern', *Critical Inquiry* 30, no. 2 (1 January 2004): 225–48, https://doi.org/10.1086/421123.

30 This strategy is not without its own problems. By supporting the reduction of escape cores sizes within each individual towers, the bridge has made the two co-dependant, with the effect that neither function effectively if both must be evacuated at the same time. This scenario occurred during a hoax the day after the September 11 attacks in New York, and has since lead to the building need to rely on lifts to support egress. See Wood, A.; Chow, W. K.; McGrail, D. (2005). "The Skybridge as an Evacuation Option for Tall Buildings for Highrise Cities in the Far East". Journal of Applied Fire Science. 13 (2): 113–124

31 Buildings, *Fire Grading of Buildings*. P. 70

4: Lagos
The Flight of a Spark

On the practical politics of spatial setback

4.1
Gunpowder and Thatch

> Peaceful penetration is the uniform and unbroken course of the development of Lagos since its cession in 1861. No rising of the Natives and no punitive expeditions draw a red streak across its story of peace and trade.[1]

So begins Sir William Geary's *Nigeria Under British Rule*, though his account of the cession itself must admit to the occasional blood-stain or scorch-mark. Committed to establish the British Empire as an arena of free trade, and to end slavery by either diplomacy or force, on Christmastide 1851 Lord Palmerston ordered that Lagos be reduced by bombardment from the HMS *Bloodhound* and *Teaser*. After 5 days of fighting, during which a rocket exploding in a magazine caused a fire that left most of the town destroyed, the local ruler was driven out, and replaced by a favourable alternative. From 1851 to 1861 the port remained nominally independent, under the puppet King Docemo. During these 10 years the slave-trade with America was abolished, but the development of commercial relations with Britain faltered. Correspondence that Geary draws upon attributes this to a lack of 'effective' government, in particular surrounding the difficulty of defining and defending 'private property', a concept that was foreign to the indigenous culture.

On the 22nd of June 1861 Lagos was taken possession of as a British Dependency. 'No injustice' was done to Docemo; he was to be provided with a generous personal pension. This offer was delivered to him by HMS Prometheus, which then took him to the British Consulate to complete the paperwork. Geary does not comment as to whether Docemo was pleased with the proposal, but it seems he did not put up a fight; as recalled by Otonba Payne, who would go on to be Lagos's Chief Registrar:

> King Docemo and chiefs stood by the flag staff in front of the consulate and went through the ceremony of touching the rope, by which the British Ensign became unfurled while

> simultaneously the frigate thundered a Royal salute of 21 guns, while all the school children of Lagos then present sang the [British] National Anthem.[2]

Article 1 of *The Treaty of Cession* read:

> I, Docemo, do, with the consent and advice of my Council, give, transfer, and by these presents grant and confirm unto the Queen of Great Britain, her heirs, and successors forever, the port and Island of Lagos with all the rights, profits, territories, and appurtenances whatsoever thereunto belonging, and as well the profits and revenue as the direct, full, and absolute dominion and sovereignty of the said port, island, and premises, with all royalties thereof, freely, fully and entirely and absolutely.[3]

Article 3 thought to add that Docemo's stamp on the treaty would be taken as proof that there were no other native claims on the land, and that Lagos was indeed his to give away. While Geary offers us the official story, other accounts include details he would omit. The *Anglo-African,* a Lagos newspaper, reported on September 12th 1863, Docemo proclaiming (in his native Yoruba) "Mo ofi ilu me torreh…" ("I have not made a present of my town. Did I not in the government house… refuse to sign? Did I not refuse on board the Prometheus? At my palace did I not also refuse to sign?") .[4] This statement does not appear within the official history, though it garnered official response, by Governor Glover, who promptly declared a state of emergency:

> Gentlemen: King Docemo has this day denied that he ever gave over his town to the Queen of England, thereby defying the Queen's supremacy over this her colony of Lagos. I hereby call on all loyal subjects of her majesty to be sworn in as Special Constables for the due assertion of Her Majesty's authority and the protection of life and property within her colony of Lagos.[5]

This assertion of martial law led to the 'excitement of the 13th' in which the city was once again destroyed by fire-bombing. Docemo surrendered, was stripped of his pension, and fined £50 for the bother. But absolute assertion of British Sovereignty did not end the challenges of colonisation, chief amongst them remaining the issue of defining and defending private property. One of the first laws passed by the newly established Town Council, Ordinance 9 of 1863, established the legal infrastructure for purchase and sale of title deeds. But the indigenous built fabric (fig. 4.1) and construction practices also posed problems:

> Being essentially Yoruba, the unit of housing amongst the prosperous indigenes is the compound consisting of a group of compartments built around a rectangular open courtyard… The roof consists of roughly prepared palm fronds or bamboo over which a thick layer of mud was spread as a preventative against fires.[6]

This 'black mud' troubled a commission of medical and engineering officers who outlawed it, declaring it injurious to health.[7] Its properties as a fire-retardant were found wanting, also. According to contemporary reports in the *Observer*, Lagos was the 'veritable *fire-place*' of West Africa, suffering at least two building fires every night.[8] And moreover, the high cost of local construction materials hampered development; "the greatest impediment to building with us is the difficulty of procuring material. Bricks are made here but some are bad and all far too expensive... badly sawn timber wood costs fully twice as much as building timber in England".[9] In 1877 a particularly destructive fire, caused by wadding discharged from a pistol, destroyed a third of the island. It prompted the Lagos Town Council to enact its first by-Law, as a means to address the complex of policing, public safety, urban planning and economic concerns it then faced: the law forbade the discharge of firearms or the letting-off of fireworks; demanded all buildings be built at a set distance from their property boundary to prevent spread of flame; granted police the power to demolish buildings that did not comply with this 'set-back'; outlawed the use of thatch as a building material; established corrugated iron as the mandatory fire-proof roofing material; and removed duty from the importation of this product, which was not manufactured in Nigeria.[10]

On Reason and Treason

We have come to expect irony within attempts to trace the legitimacy of law back to higher authority. Nonetheless, it is important to step back from the engrossing historical detail of this story, and review its legal rationale, which traces out an Escher-like series of contradictions and aporia. The legal status of the treaty is the most obvious place to start. Even under British Law, the legality of sovereign cession depended upon a principle of 'continuity', recognizing the right of existing property owners. As was well known by the settlers, in Yoruba culture land was understood to be fundamentally inalienable, held in trust by the community through an administrative hierarchy of family, clan and royal association. To construe this land as a lawful part of the British Commonwealth thus required a number of imaginative leaps.[11] To take Docemo's signature as lawful we must first assume the alienation of land, via the administrative class of 'White-Cap Chiefs', on to Docemo, of which no evidence exists. Secondly, we must choose to ignore Docemo's proclamation – more convincingly his own than that of the treaty – that he did not make Lagos a gift to the Queen. Finally we must simply accept that Lagos was *already* the Queen's, so as to take for treason, the non-gifting of what wasn't his to give. Nonetheless, this is the view that was successively upheld in court until as late as 1957; the treaty was not strictly *legal*, but as an Act of State it was rather deemed to be above the law, even those laws pertaining to the legality of cession.[12]

But ironies of logic do not end there. There is a certain flair exhibited by an assurance that 'no injustice' was done to a deposed King on account of a promised pension, a pension annulled upon forced overthrow, an overthrow for which he is then charged costs. The structuring of 'free' trade through legal requirements, preferential taxation, and state-sponsored monopolies is its own story. But the circularities and reflexivities of legal thinking that I wish to dwell on here are the ones that this series of events and proclamations inscribe into the built fabric of Lagos.

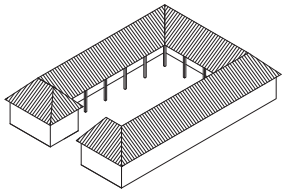
fig. 4.1-3 (top to bottom).
Genealogy of setback
Liam Ross and Calum MacDonald

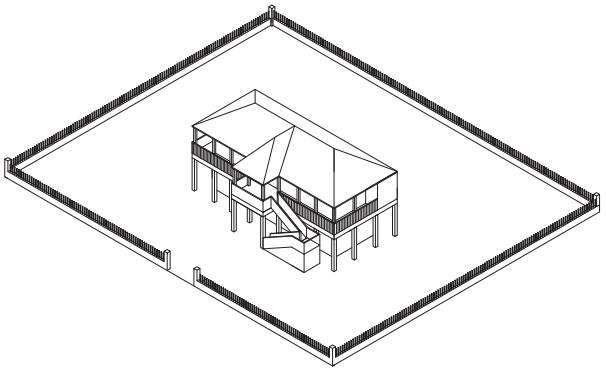
Yoruba Compound form; 1877 British 'Government House'; Idumagbo Avenue Housing Scheme.

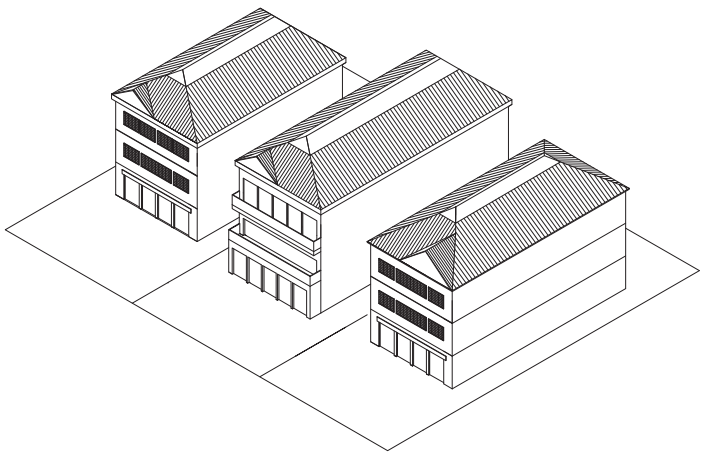
Assuming a remarkably reasonable set of concerns so soon after repeatedly fire-bombing the city, the first Lagos building regulation – the 'setback' code - brings about a particularly subtle ruse. Ostensibly concerned with the health and safety of the populace, and expressing a governmental ambition that they not set their own houses on fire, this rule rendered unlawful the remaining physical fabric and construction practices of a city which had already been largely destroyed, and whose patterns of ownership had been undermined. In one set of related measures, this law strengthened the state's monopoly on violence, outlawing the use of personal fire-arms; it empowered the British authorities to demolish existing building stock where it saw fit, clearing the way for new roads; it sought to protect the new buildings – of settlers, or of prosperous locals – from the risk of accidental loss; and it established a new supply chain of imported goods, freeing British manufacturer from the need to pay tax when importing them. That is, if the cession of Lagos demonstrates some of the theoretical absurdities of discourses on Sovereign Right, this first Nigerian building regulation marks the transition to a different way of thinking. It offers us a kind of diagram - a representation in miniature - of the processes through which the direct expression of Sovereign violence comes to be governmentalised. It also reminds us that at times we need to be able to see that apparently technocratic phenomena like building codes, and the marks they leave on the city, are a 'continuation of war by other means'.

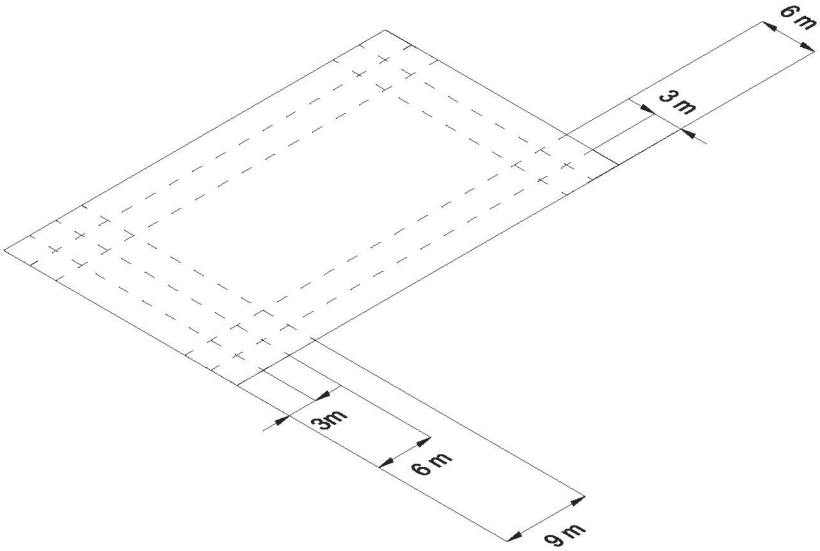
Mess Trajectories of the Setback

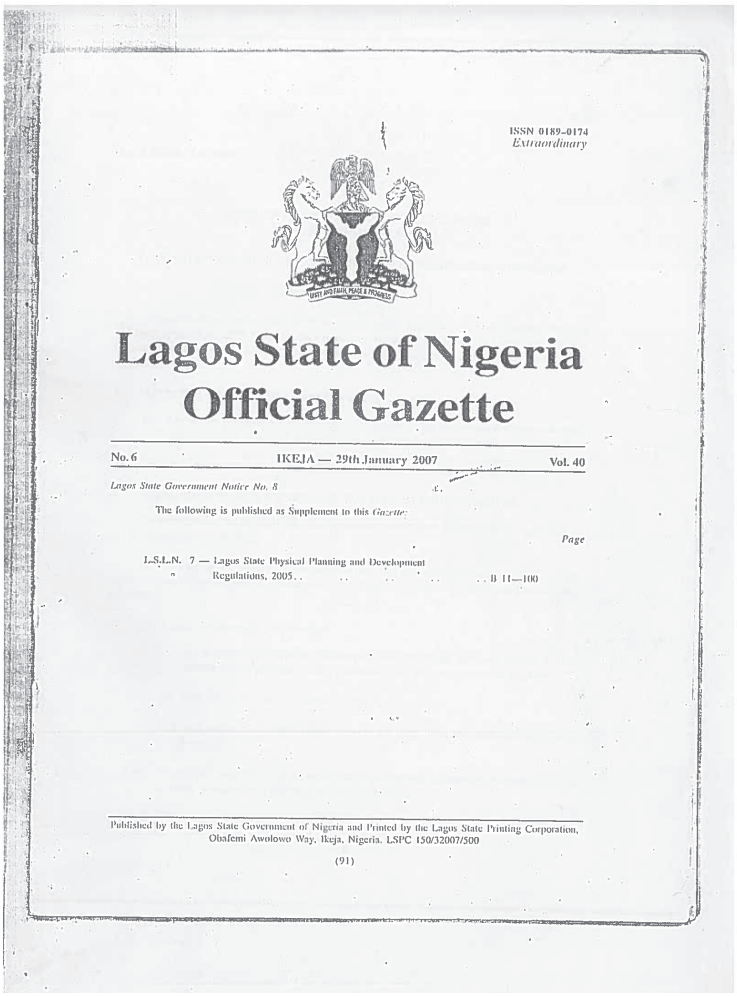
The setback code is one of the most historically significant factors in the development of the city's contemporary urban form. It continues to be enforced today, defined by Lagos State Physical Planning and Development Regulation 15. This rule sets out a minimum distance that any development must retain between building and the boundary (fig. 4.4). This distance ranges from 3 to 9 metres in depth, circumscribing the buildable area, and development economics, of any plot. On paper its effect is to define Lagos as an essentially suburban settlement, making it illegal to build either up to the street, or up to adjacent properties. In terms of urban form, the rule effectively outlawed, indeed inverted, the courtyard pattern that typified Yoruba settlements. It likewise made illegal the dense, Portuguese-style urbanism that had been established in downtown Lagos, arriving via re-patriated slaves (fig. 4.5). Following the paradigm of the British settlement in Ikoyi, its suggests an ambition to channel the ur-











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Lagos State Government Notice No. 8

The following is published as Supplement to this *Gazette*:

Page

L.S.L.N. 7 — Lagos State Physical Planning and Development Regulations, 2005 . . . . . B 11—100

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(91)

ban form of Lagos through the model of a house in gardens (fig. 4.3).

fig. 4.4
Lagos State of Nigeria Official Gazette
Front Cover, Lagos State Government of Nigeria. 'Lagos State Government Notice 8'. *Lagos State of Nigeria Official Gazette* 40, no. 6 (2007). Illustrative diagram of LSPPD Regulation 15, Liam Ross and Calum MacDonald

This document includes the Lagos State Physical Planing and Development Regulations, of 2005. Regulation 11 defines 'Permissible Setbacks'. It notes that "For any development permit to be obtained, the architectural drawings shall conform to the following setbacks: a) The distance between any residential building and the property boundary (beacons) at the frontline shall not be less than six (6) metres with three (3) metres at the rear, right and left side airspace respectively in all Government Reservation Areas (GRA) and all private approved layouts…". It goes on to define varied limits in other districts, and surrounding roads and utilities.

If its stated ambition was to improve the fire-safety of the city, its effects in practice have been somewhat different. While the code suggests no development is possible within the setback, this zone is in fact the most economically and socially active part of the city. Comprising the street frontage of every building in the city, this area is structured by two features, the 'fence' and the 'ditch', the city's ubiquitous infrastructures of security and drainage. Behind the fence, the setback is used for all manner of adjunct facilities: security posts, guards houses, servants-quarters, generators, diesel storage-tanks, utility buildings, cargo-container yards, even small domestic settlements. On the street side, it accommodates a range of economic or cultural activities; the kiosks in which every-day untaxed trade occurs, the vulcanizing stations of the cities famous car-mechanics. It provides a home for local 'area boys', for street-side gin-distilleries, for the cities 'mendicants', and for its Mosques.

That is, this part of the city is by no means undeveloped, it is not empty, rather it is developed 'informally'. The setback code structures a space that accommodates those practices and programmes which do not have a designated place within the city. And in doing so, it becomes strictly counterproductive. Rather than creating a system of urban fire-breaks so as to protect property development from the risk of fire, it distributes people, activities, materials, and buildings in such a way as to maximize the likelihood of fire-spread, creating a web of unregulated structures and activities that line the frontage boundaries of public and private space throughout the city. Emerging from an attempt to quell the streets, to bring them under governmental control, its effect today is quite different; dismantling the existing urban patterns of publicity and privacy, it developed an urban form that pre-supposed public lawlessness, retreating its architecture into compounds, leaving behind an ill-defined urban space which could be readily ceased by other actors. In the stark contrast of these intents and effects we seem to be offered an example of the way that sovereign assertions of law, codes and standards can often exist in direct and blind opposition to the realities of everyday life.

In the previous chapter I used the city of Edinburgh to reflect on a set of *congruences* between Law and the City. I sought to show how law sometimes emerges from, and is re-inscribed into our urban environment, such that the spatiality, materiality and texture of our cities has a shaping effect on the mentalities of government. In this chapter we are confronted with a different city, and a different code, one which has been violently imposed upon its social and physical context, and one that evidences an incongruity between urban fabric and legal rationale. Indeed, it was this anomaly, the 'mess-trajectory' constructed by the Lagos setback code, that provided the impetus for this enquiry. But my purpose in recounting that enquiry is not to critique that code as a representation of colonial politics, nor even on

fig. 4.5
Urbanism of Setback
Liam Ross with Nicola Grant

A figure/ground plan of Lagos Island in 1960, as it claimed independence, provides an archaeology of the different historical patterns of settlement. Downtown Lagos (left and overleaf) was first settled by repatriated Saros (1) and Agudas (2), and is informed by an understanding of Portugese architecture and planning. The first British settlement was on Ikoyi (right and overleaf), and was developed in a markedly different style (3). The British Council Headquarters are located in the centre of this garden suburb (6). The edge of the British Camp is still identifiable through the location of State and Military institutions. The colonial polo grounds (4) became Tafawa Balewa Square at independance. The former army barracks at Obalende (5) have been re-developed, but the current Lagos State Police barracks are close by.

account of its counter-productivity. Rather, in this chapter I wish to reflect on the *political polyvalence* of standards, on the *difficulty* of attributing a single governmental rationale to a particular governmental technology.

In this opening section I offered a way into that reflection, noting the contrast between ambitions and effects. In the second section, I wish to reflect upon that contrast theoretically, drawing on literatures from Law and Geography studies. Specifically, I draw upon the concept of 'Seeing like a City', as it is developed by Warren Magnusson and Marianna Valverde. Through this concept, these scholars point to a particular capacity of urban life to ignore, contest, or actively defy the legal frameworks that would seem to circumscribe it. And while recognising the political polyvalence of such contestation, Magnusson will nonetheless suggest that we recognise its necessity, as a means through which the sovereign gesture of law is 'recycled', re-incorporated into the everyday life of the city. Through this chapter I wish to use the Lagos set-back as a means to study how laws, even those that are violently imposed, come to be absorbed and re-directed by a city, and to reflect on the role of building in that process of recycling.

4.2
See like a City

Domination and the City

That Law and the City sublimate violence, and define spaces of Sovereignty, should come as no surprise. In the previous chapter, we recognized the 'Leges Burgorum' of Edinburgh as a means to define a set of legal exceptions, carved out of an underlying landscape of feudalism. The physical fact of the castle, and the enclosure of its city walls represented the authority that defended those exceptions, symbolizing and exercising the Kings capacity for violence. In his *Legal History of Cities*, Gerald Frug offers similar reflections on the relation of law and space within the European medieval town. He notes that, while these settlements offered a kind of physical and legal clearing, this did not make their inhabitants particularly 'free'. The medieval town was, of course, filled with internal forms of hierarchy and struggle, splintering's of interest between nobility, crown, an emergent 'state', new class associations and individual interests that would bring an end to this urban form. Indeed, in Krug's account, the physical and regulatory spaces of the 'modern city' are built, less on the foundations left by the Medieval town, more from its gaps, failures and omissions.[13]

Frug's account accords with and draws upon that offered by Max Weber in *Economy and Society*. Weber famously studied the sociology of European Medieval settlements, likewise noting their relative freedom from the authority of Law and the threat of Sovereign violence. However, in his analysis, this freedom was precisely what made such places an incubator for new and alternative modes of domination. Indeed, in Weber's sociology, the concept of the 'City' – of densely settled, relatively bounded, impersonal and autonomous places – is synonymous with the possibility of 'non-legitimate domination'. [14] The intense forms of co-dependence constructed by urban environments create a circumstance in which authorities based upon Law, Tradition or Charismatic Leadership founder, being displaced by emergent modes of authority that operate in parallel, in ignorance, or in open defiance of the rules. We can't understand ev-

erything about a city by looking at its statute books; the spaces of innovation and change are often those that are ill-defined by law. Indeed, by focusing on the *congruence* between law and the city, we might blind ourselves to other questions, and walk into a methodological trap; gleaning traces of order from the mess of reality, we might construe both the city, and government, to be more organised than they actually are.

Seeing Like a State

Within the field of Law and Geography studies, this methodological risk has been given a name, that of 'Seeing like a State'. James C. Scott coined this term in his eponymous book, using it to explains why 'certain schemes to improve the human condition have failed'.[15] Scott suggests that the (often well-intentioned) ambitions of architects, planners and governments often do violence to local and practical modes of organisation, precisely on account of this optical pre-disposition. Only capable of seeing within the terms of their own means of intervention, they fail to see what is actually happening 'on the ground'. Scott's critique would seem easy to level at Lagosian planners, both colonial and contemporary. That city seems to be organised through a by-law that imposes a utopian that is either ignorant of, or does active violence to, existing everyday urban practices.

But we could also see this risk operating at a different level; indeed, Scott's term has developed a wider currency, one that folds back onto questions of political theory, and research methodology. In *Seeing Like a State, Seeing Like a City,* Warren Magnusson uses it to describe a perceived state-centricity within political theory. Again, thanks to a tendency to assume the subject-position of architect/governor, Magnusson suggests that political theorists are pre-disposed to assume the theoretical necessity of the State, and so to assume that defining and securing concepts of Sovereignty is their important theoretical task. Magnusson makes this argument with reference to the same imaginary relationship we have identified, via Andreas Philippopoulos-Mihalopoulous, as existing between the city and its codes and standards. The disciplines of Law and Urban Planning are engaged, he suggests, in a kind of mutual self-legitimation. Political theorists assume the necessity of something like 'Sovereignty' thanks to a normative leap; The State, and so a Sovereign authority, is all around us, written in to the bricks-and-mortar of our legal frameworks, social practices, and built environment, and so appears practically necessary.[16] This additional twist is likewise readily applied to our particular case. We might well say that the authors of the first Lagos Town Council by-law were engaged in a kind of reflexive self-legitimation; they 'saw like a state' inasmuch as their fundamental concern was to define Sovereign Right, an end to which urban fire, constructions practices, and tax arrangements were merely a means.

Recycling Sovereignty

If we accept Magnusson's argument, we might be concerned that our current study suffers from the same optical problem; by looking at Lagos through the terms of this original governmental programme we seem to recognize its legitimacy, even as we draw attention to its failures. Responding to this concern, Magnusson engages with Scott's term in order to define an alternative way of looking at the relationship between city and law. To do so he draws on Weber's account of the special sociological character of the city as a means to sketch an alternative political theory, one which abandons the subject-position of the planner, replacing it with that of the anarchist. Politics is here construed precisely as a process through which assertions of Sovereignty are *resisted*. He suggests that the practical politics of urban co-habitation – bounded, closely settled, relatively impersonal – again provides evidence of the ways in which 'legitimate' modes of dominance (Law, Tradition and Charisma) find themselves ignored, contested, or actively defied, in such a way as to allow multiple overlapping and competing authority claims to co-exist side-by-side.

> To see like a state is to suppose that the most important political problems are resolved once sovereignty is established. This supposition is very much at odds with experience... Another way of achieving a kind of civil peace is when rival sovereignty-claims are moderated or held in suspense as people with radically different views work out ways of living side by side. This latter way is more akin to the other practices of urban life.[17]

That is, if the optics of political theory and of state planning seem to define a kind of blind-spot, a point of Sovereignty, in which law is effectively suspended, Magnusson points to a different kind of suspension that is constantly occurring 'on the ground', as rival actors seek to employ the law for their own purposes. His argument echoes that offered by Virno in section 2.3; in these everyday moments of suspension, we see the emergence of pre-legal 'regularities', of alternative modes of domination, and struggle for co-existence, that wider authority claims channel, drawing upon them for their validity. Indeed, Magnusson also cites Schmitt in order to suggest that, within this struggle, we recognise Sovereignty not as the 'first mention' of politics, but rather its 'McGuffin':[18]

> To use Schmittian language, sovereignty is the exception that is postponed, evaded, deflected, subverted, and ultimately transfigured… The sovereign promises to repel the invading army or to suppress the riots; the sovereign expects obedience in return. But, this bargain – which is not really a bargain, since people have no choice but to accept it – is just a moment in the re-organization of the city. Ultimately, the sovereign and the sovereign's pretensions are incorporated as another element in the life of the city. The sovereign is not the rock on which the city is built, but part of the rubble that the city transforms into reinforced concrete.[19]

Magnusson dubs his political-theoretical programme 'Seeing Like a City', using it to demonstrate ways in which law comes to be shaped by the practicalities of its application, and the resistance it faces. This term has been adopted by other scholars, most notably Marianna Valverde, Professor of Criminology and Sociology at the University of Toronto. I introduced Valverde's work in Part 2 of this dissertation, offering it as a means to demonstrate the utopian character of urban legislation; in studies of her native Toronto, she showed us that a majority of buildings exist within a 'legal non-conforming use' category, undermining the notion of 'comprehensive' zoning. Likewise, I used her work to demonstrate the political polyvalence of codes; her work on 'diversity' legislation in Toronto shows us how these frameworks often disadvantage those marginalised groups they are intended to support.[20] In *Seeing Like a City: The Dialectics of Modern and Premodern Ways of Seeing in Urban Governance* Valverde brings her work into dialogue with Scott and Magnusson's terms, but in a way that complicates their oppositional logics. Taking the constitutional questions surrounding the implementation of US Zoning Law as an example, she considers the landmark case *Village of Euclid v. Rambler Reality*. This case, through which the Supreme Court found in favour of the Village of Euclid's right to impose planning restrictions – even when shown to damage the value of private property - is widely seen to have paved the way for widespread use of planning instruments within the US.[21] But reviewing the case, Valverde argues that this decision effectively worked both *for* and *against* zoning, defending the possibility of such 'socialist' requirements only through incorporating a range of generous legal exceptions, 'structural contingencies' that allowed them to be bypassed in specific circumstances.[22] Through this example, Valverde implies the need to recognize that governmental initiatives which might seem to 'see like a state' – whether that state be Imperialist, socialist or liberal – are often designed to incorporate specific modes of suspension that accommodate alternative viewpoints. As such, the way in which laws and standards fail – the way that they create residues, others, outsiders – might in fact be part of their design, a mode of pre-emptive self-limitations. Nuancing Magnusson's term, then, she suggests that to 'See Like a City' is to recognise that rules, through their mechanisms for non-compliance, can themselves be means to broker 'civic peace' through the recognition of competing views and concerns.

If I began this chapter by seeing like a state – trying to understand Lagos through its rules and their rationale – I wish to end it by attempting to see like a city. That is, in the final section below I wish to return to the setback code, but with a focus on the way it works 'on the ground'. The opportunity to do this was provided by an associated research project, funded by the British Council.[23] That project allowed me to visited Lagos, during the spring of 2012, accompanied by a Nigerian colleague, Tolulope Onabolu. During that visit we interviewed a number of architects, lawyers and planners on the way they work with and around this code, at the same time as conducting a drawn and photographic survey of the way it is being

occupied. What we hoped to explore through this study was the way this code constructs a space, both legal and physical, through which the concerns of a range of state and non-state actors emerge and are gathered. The survey and interview extracts are included in section 10, but I reflect on the findings below.

4.3
Practical Politics of Visibility

City of Fences

> Let me tell you what interests me in the rule. When I travelled, when I went through to European cities, I asked myself, why do these big cities look so *expansive*? It's because they don't have fences. You can actually walk to the doorstep because they don't have fences. In Lagos you know we are all fenced in and the roads set back.[24]

The setback code is well known to local architects, lawyers and urban-planners, and it is recognised to have a formative effect of the city's urban fabric. As suggested in the above quote, from our interview with Tunji Odunlami, Director of Physical Planning at The Lagos State Secretariat, the code defines Lagos as a 'city of fences', one with no designed, active street-frontages. But our enquiries also prompted confusion; it was very hard to find the rule written down anywhere, and the people we interviewed were uncertain as to its purpose. The rule simply *was*; they knew it because they could see it, written into the fabric of the city. It did not take long to understand why. Although Nigeria developed a National Building Code in 2006, by 2012 this had yet to be adopted by any particular State. Building regulations in Nigeria are therefore still a matter of local by-laws. And Lagos State does not publish its by-laws online, nor through a consolidated handbook. Indeed, the very *difficulty* of approaching this particular law took on an allegorical, Kafka-esque quality. Lagos State publishes its by-laws through 'Gazettes', A4 photocopied pamphlets that record the passing of new laws, organised by date. The current iteration of Physical Planning and Development Regulation 15 are published as part of the "Lagos State Physical Planning and Development Regulations", of 2005, included as a supplement within the *Lagos State of Nigeria Official Gazette*, No. 6, 2007.[25] This pamphlet, along with all the other laws of the State, are available only from the Secretariat building, a three-hour, heavily congested drive from downtown Lagos. At the secretariat they are stored in the 'Cabinet Room' - a room full of cabinets - housing identical looking Xeroxed A4 documents. That room is supervised by an elderly official, with pronounced cataracts. With difficul-

ty, the single copy of the Gazette 6 was located, but a problem then presented itself. We could not be given the only remaining copy of the Law, and the Secretariat itself did not have any photocopiers. This impasse was only overcome through what seemed like a by-product of the by-law in question. Outside the Secretariat, in the 'setback zone' of that building, local entrepreneurs have responded to this governmental lack, and set up informal photocopying kiosks. To stand 'Before the Law' in Lagos is not to wait interminably outside its gates; it is to sneak up to the fence, huddle under its eaves, dragging a power cable out of its windows. [26]

But as to the purpose of this particular law, the gazette is of no help; in its current form, no rationale is stated. To understand its governmental ambition, then, requires a personal interview. And even for Tunji Odunlami, the most senior figure concerned with the States building regulations, the answer is not entirely clear:

> Gunpowder and thatched roofs, they are not friends you know. They go up in flames. Yes, the setback rule evolved from British regulations, from colonial times, as a means of stopping spread of flame. However, I don't *think* that is what it is about today. The setback, for all terms and purpose, does not belong to you. Before the setback, that bit of property does not really belong to you. It is an easement, the government can take it back at any time, for road widening for instance. It doesn't say this in any laws, but I make a deduction. That's why you can't build your main building there, but also why there is a relaxation on the kind of structures that can be built in this space. You can put up temporary structures there, and we don't hound you.[27]

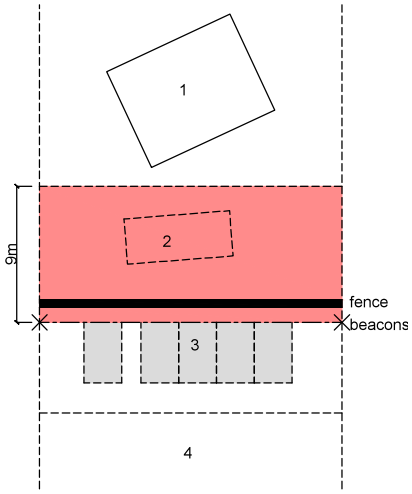
That is, its contemporary governmental rationale today has nothing to do with fire; the urban problem that it now seems to address is that of infrastructure expansion. Lagos lacks a sewage system, a storm-water drainage system, indeed much of the fixed physical infrastructure associated with a city of its size. Its notorious 'Go-Slows' (its areas of perpetual gridlock) are understood to threaten the city's function as the commercial hub of Nigeria, and therefore road and infrastructure expansion are key areas for governmental action. It is in this context that "the retention of the provision for setback zones in the statute is critical to maintaining the stability of the State's economy".[28] The temporary settlement of this zone is not seen as a governmental problem, rather it is a 'meanwhile use' that holds the space open for future appropriation.

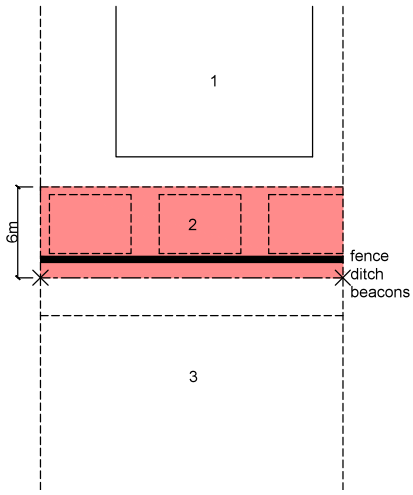
Legal Occupation

But if that is what the code means today, this has not always been the case. Indeed, its purpose and requirements have been re-conceived and re-articulated numerous times. This is not unusual within Nigerian legislation, much of which was imported by the British. Until 1960, when Nigeria claimed independence, all Nigerian plan-

fig. 4.6
Occupying the Setback:
Ikoyi, Vulcanizers
Photograph: Liam Ross. Illustration Liam Ross with Maria Esteban Castenas

1. Dutch Colonial House (derelict)
2. Cargo Storage
3. Vulcanizers
4. Road




1
2
6m
fence
ditch
beacons
3


HAIR CUTS

fig. 4.7
Occupying the Setback: Obalende, Mammy Market
Photograph: Liam Ross. Illustration Liam Ross with Maria Esteban Castenas

1. Lagos State Police Barracks
2. Mammy Market
3. Road

ning laws and building regulations were based on British models. Even today, the primary legislation remains that of the *1932 Town and Country Planning Act,* introduced to Nigeria in 1946, and retained post-independence. Initially drawing on the same putative authority, and retaining the same legal architecture, these rules have nevertheless been edited and re-purposed to the local environmental and political exigencies. In the case of the setback code, for instance, by the early 20th century this had already been re-conceived as an instrument of public health. When the Lagos Executive Development Board (LEBD) was set up to respond to an outbreak of bubonic plague, they recognized the potential within the setback to define a 'cordon sanitaire' around dwellings. They re-purposed the code to establish restrictions on the density and height of buildings, expressed through the requirement that no part of the building – with the exception of balconies, deemed beneficial for health – should extend in front of an imaginary line at 60 degrees to the boundary. While legitimating clearance and reconstruction in the slums, this change reduced the amount of required setback - disease was seen as less mobile than fire - also permitted a general densification, with schemes such as Idumagbo Avenue (fig. 4.2) acting as models.[29]

The setback code was reconceived again in 1946 when, carried by the Town and Country Planning Act, Ebenezer Howard's Garden City movement arrived in Lagos. The suburban spatiality of Ikoyi, the original British settlement, was rediscovered as a nascent Garden Suburb.[30] Its plan, seen as a native equivalent of Welwyn, informed Lagos planning in the 1940s-60s. In this period, the LEDB density rules were re-written, re-establishing a minimum setback, and reinforcing the house in garden pattern; they required that '*not more than 50% of the site should be covered for residential purposes, or 70% for other uses, and that an air space of 5'6" be left round a single storey building other than a 3'-6" boundary wall in front of the building line'.*[31] Today, in the context of ambitions to establish a national building code, the setback offers other potentialities. Lagos State requires all rooms to be provided with cross- or adjacent-ventilation - an environmental requirement that would be both unthinkable and unpractical in-built fabrics that have developed from the European medieval city – something that is achievable because all buildings are already provided with air-space to all sides. That is, it is difficult to attribute a single rationale to the Lagos setback code. This statute has created an opportunity for legal re-appropriation on the part of the town's planners. Originally rationalised as a means to limit fire, it has since been construed to have a range of other governmental values; as a public health measure, as an environmental asset, and as an easement for fixed infrastructure.

Planned Informality

To see the code in terms of its original urban ambition, the best place to look is the British Council headquarters. These are located in Ikoyi, the former British settlement. Here we see the setback

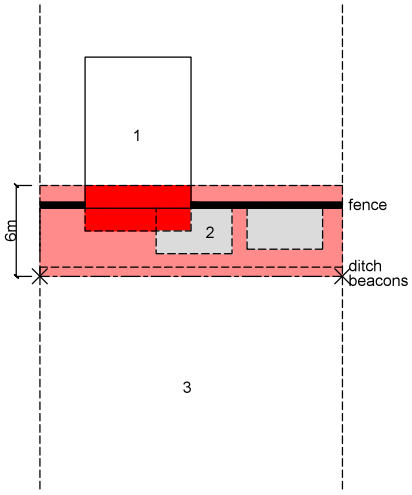
as an instrument of security, in the face of a presumed urban lawlessness. Outside that building's compound, a disruptive surface of raised beds has been planted up to the road-side, prohibiting informal commercial activity. The fence here takes the form of a white stucco wall, with chunky Iroko-clad steel verticals. Stepping over the ditch, access is gained by way of a single-story security building; the kind of adjunct facility that, in practice, are allowed within this zone. Inside the wall, a ramped, landscaped garden provides the regulation 9 metre setback to a second round of Iroko members, tastefully screening a curtain-wall of anti-ballistic glazing. But this clear architectural expression of the law is unusual, even exceptional; only across the road, a more relaxed scene exists. Here the setback has been occupied by a vulcaniser's workshop, who use the 9m space as a workshop; behind the fence, in the garden of an abandoned colonial mansion, shipping containers support this informal street-side commerce (fig. 4.6). Heading west through Ikoyi this arrangement repeats itself; next door is a gin distillery, a garden centre, a ceramics shop.

fig. 4.8
Occupying the Setback: Lagos Island, Auto Kiosk
Photograph: Liam Ross. Illustration Liam Ross with Maria Esteban Castenas

1. Flats
4. Street Kiosks
3. Road

Reaching Obalende, we find ourselves at the edge of the former British settlement, where the army barracks once stood, in an area still characterised by institutions of State. Here the required setbacks are deeper, and within them we find more organised settlements. At the Lagos State Police Barracks, a 'mammy market' occupies the zone (fig. 4.7); rows of commercial stalls, with living spaces above, provide accommodation and employment for the wives and mothers of the poorly paid policemen who work in the building. At the Lagos Motor Boat Club, the space is convenient for storing boats; at City Mall, for car-parking. And at the monumental Tafawa Balewa Square we see the opportunities for infrastructural expansion provided by this rule. Here a new bus-station occupies the space between the street and this modernist arcade and parade ground, where Nigeria's independence was declared and celebrated (fig. 4.9). Indeed, a number of new bus-stations have been built across the city through the compulsory requisition of such land.

In downtown Lagos, we see the effect that this code has had on pre-colonial architecture, and the way it has shaped future development. Residential buildings that pre-date cession exist in a dilapidated state, rendered illegal by the code, where those built more recently continue to exist in compliance. In early twentieth-century development, supported by the revised codes of the LEBD, we find a denser, more urban arrangement, with apartment buildings separated by reduced set-backs, the space between them again filled with single-story adjunct facilities: a street kiosk, a taxi mechanic's workshop (fig. 4.8), a mosque. And in the commercial centre of Lagos Island, banks stand back from the street, with isolated ATM's placed in the fence, or headquarters of international companies overhang this space, making room for small scale entrepreneurs on the street below. Only the historic Broad Street is exempt from this requirement, and as such offers a moment of that 'expansive' urban environment, one where the street extents to the doorstep, of which Tunji spoke.


1
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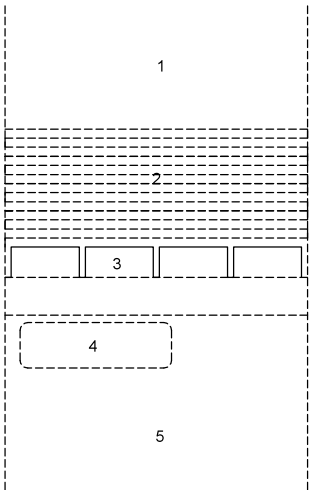
Arts & Prints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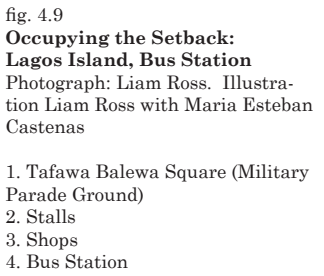


fig. 4.9
Occupying the Setback: Lagos Island, Bus Station
Photograph: Liam Ross. Illustration Liam Ross with Maria Esteban Castenas

1. Tafawa Balewa Square (Military Parade Ground)
2. Stalls
3. Shops
4. Bus Station

Authority in Suspense

The *legal* space of the setback, then, has created an opportunity for spatial occupation. The relaxed enforcement of this law – that Tunji "won't hound you" - means that, in practice, it carves out an opportunity for informal settlement. Indeed, we could say that, precisely because nothing is technically permitted within this zone, anything appears possible. As such, it seems to create a space for those who – having no land, and not being officially accommodated by the state – might otherwise have nowhere to go. And at the same time, the *physical* space of the setback creates an opportunity for legal occupation. The continued existence of this space within the city, void of legally-visible structures, has allowed successive governments to claim and re-claim it, be that for safety, public health, environmental or economic concerns. Viewed from the perspective of its original rationale, these two forms of occupation contradict each other; the informal settlement creates a fire-risk, as opposed to a fire-break. But viewed in terms of it practical application, a kind of *entente* has emerged between these two kinds of opportunities. It doesn't say this in any laws, but we can make our own deduction. On the one hand, the code permits informal development as a means to hold open the potential for future state cession; it is a means through which the State sustains a capacity for future action, but also recognizes that which, at present, it can't do. That is, in the setback code we see something like the 'impotentiality' of the state; its limited capacity for intervention, but also its self-conscious recognition, its employment of, that limitation. [32]

Returning to Magnusson's argument, what I want to suggest is that, in the lax enforcement of the Lagos setback zone we are offered an example of the suspension of law, of a space carved out from one set of authority claims, in which others compete. And this moment of suspension, we might conclude, does seem to create a kind of civic peace, in which difference lives side by side. But can we say, of this example, that sovereignty is here postponed, evaded, deflected, subverted, and ultimately transfigured? I don't think so, at least, not yet. What seems 'anarchic' about the Lagos setback is, at another level, the representation of an absolute authority. This ostensibly governmental measure, based on the distance a spark might fly and set light to thatch, is today - as it was to begin with – as a means of legitimating the state cession of land. The civic peace that it brokers is therefore exceptionally fragile; it allows the dispossessed a foothold on land outside the conventional channels of legal and economic investment, but only on the condition of their future dispossession. That is, where in Edinburgh, fire seemed to support the governmental transfiguration of sovereignty, in Lagos, that process seems stalled. And I would like to suggest that it is this state of suspension – which is both anarchic and absolutist – that prohibits anything really changing. The physical space of setback zone offers a space of possibility for government, an opportunity to constantly re-define the law; but that legal space never recognizes anything

that happens physically within that space. That is, the structures and uses that come to occupy this physical space never really become inscribed within it, they never become legally visible. They therefore cannot assist in the 're-cycling' of authority claims; there is here no 'cycle', no materio-semiotic exchange. As such, the authority of the setback code never really becomes governmentalized; the rationalities and technicalities of this rule never quite interact – they remain mutually invisible - and so never open themselves up to exchange.

The *Techne* of Setback

But if the street fronts of Lagos are in a state of suspense, I would like to conclude this chapter by looking for some hints of denouement. That is, if the governmental value of the space is at present as a reserve, a kind of 'fleet in being', I would like to cast forward to think about the circumstances in which that might change. By doing so, I think it is possible to see how the legal and spatial character of this zone might steer the future trajectory of the city. This code *is* connected, for instance, to the construction of a specific identity, that of the 'public'. The state's capacity to revoke ownership is enabled by the 1978 *Land Use Act*, which requires that such land to be designated to a specific 'public purpose'. At present, this concept appears ill-defined; the Land Use Act has empowered the state to cease land for almost any conceivable purpose, including the purpose of gifting it to other private individuals or companies. Attempts to contest this in courts – as in *Oviawe v. Integrated Rubber Products LTD* – have so far failed.[33] Nonetheless, should such requisitions become more regular, the setback zone might offer a 'boundary object' through which the definition of this identity becomes more well-structured.

The most obvious 'public' purpose, as we have seen, is that of infrastructure expansion. Through the requisition of this land for street-widening and bus-interchanges, this code is already facilitating a slow, ad-hoc morphological transformation, from a town of dense courtyards settlements, to a metropolis of wide avenues, through which the colonial house-in-garden was only a disappearing mediator. Through this process, more streets within the city will come assume that 'expansive' character which Tunji found wanting in the city. And relationships between public and private, and between formal and informal trade, will shift, both becoming more architecturally mediated. That is, if Lagos is to develop an urbanism of the active street-frontage, one where you can 'actually walk right up to the front door', it will need to resolve through built structures those things that are accommodated spatially by the setback; that urbanism will need to think of new approaches to security, and to fire-safety, but it will also need to accommodate people and uses that currently have no place, formalizing aspects of the city's economy. And transport is not the only infrastructural concern; flooding, for instance, is a major problem in Lagos. 50% of the city is less than 6 feet above sea level, in a city which lacks either sewage system, or a storm-water infrastructure. The setback zone creates an easement along which a conventional drainage infrastructure might be

installed, but perhaps also the combined footprint required for an urban-scale 'soak away'.

But will the current spatial occupation of the setback shape the way it is developed in future? We have seen that, at present, the setback operates as a kind of 'othering' device, gathering a wide variety of peoples and practices with nowhere else to go. This gathering offers, in some sense, its own definition of the 'public'; everything that occurs within the zone is open to view by all, and is not 'private', in the sense that it cannot be owned. While this diverse array of actors has no current legal claim to the space, might they find ways of forming networks with other governmental concerns, so as to find a place within a new, legal definition of the 'public'? Or alternatively, might they assert their own 'principle of continuity', making claims to private ownership? Nigerian law does recognize 'squatters rights' for instance; it is conceivable that, through settling and occupying the zone, some of its tenants might become recognised as 'legitimate' owners. That is, this mechanism of state-cession, cutting through both tribal and private ownership, might create a path toward direct occupation.

There is pressure from the other side of the fence, too. Limits to foreign investment for Naira-based development funds are currently leading to a sharp rise in local land and property development. The development ceiling for plots in Lagos is set by a combination of planning factors; maximum eaves heights, car-parking provision and the setback code. Given that the *proportion* of a site given over to setback reduces with plot *size*, the code is leading to a phenomenon of plot bundling, and leaving small plots undevelopable. After outlawing indigenous patterns, imposing its own imported model, and retuning this to afford subdivision, the code is once again reshaping the city, steering development toward super-plots. But the reducing margins of development might support changes to the legislation. If developers could contribute to infrastructure-expansion in other, more spatially economic ways, might they broker new spatial codes, allowing them to build hard up to the street, or their neighbours?

And while we have recognised fire was the McGuffin to this story, might it return to haunt it? The risk of urban fire constructed by the code is real; a fire spreading within this space might lead to regulatory reform. Alternatively, a simple recognition of the mess that the code is creating, the way it channels informal development to the most visible parts of the city, might be an impetus to change. In whatever configuration these issues come together, however, the practical political question they raise seems to be one of visibility. That is, to what degree might the peoples and the practices who currently occupy this space be better off 'in the dark'? The current non-enforcement of this code might well be considered 'tolerant', even 'cosmopolitan'. Even for the wealthiest Lagosian, the poor are only on the other side of a fence. And in a country in which 80% of taxable individuals remain outside the tax net, the 'impotentiality'

of the State is an important practical consideration. If the dividing lines between public and private in Lagos are to be redrawn – through a revised strategy to mitigate fire-spread, a widened street, an improved public-transport infrastructure, a sustainable urban drainage scheme, a more profitable or attractive pattern of settlement - what of the peoples, activities and functions which currently occupy this legal shadow? At what moment will it be seen as beneficial for them to take shape, legally and spatially?

Note on Illustrations

The above analysis was supported in its development through interviews with local architects, lawyers and building contractors, as well as a drawn and photographic survey of the setback zone. That material is presented in the Appendix to this dissertation, in folio 10: A Survey of the Lagos Setback. Those interviewed were Tunji Odunlami, Director of Town Planning, Lagos State Government, Fred A Coker, Managing Director, Adedenyi Coker Consultants, Afolabi Aiyeola, Project Executive, Arbico PLC and Morenike Nedum, Partner, ABFR & Co. An edited transcript of the interview with Tunji is included in the folio. The drawn and photographic survey was conceived as a cross-section through the city, leading from the centre of Ikoyi, at the British Council Headquarters, to down-town Lagos Island, following the line marked in red in figure 4.5.

It is relevant to reflect on a practical and methodological challenge presented by this survey, through which we encountered a high level of resistance both from individuals and organisations. Permission to take photographs was requested of all subjects, but usually declined. It took 24 hours for the British Council, who had commissioned this research, to grant permission for us to photograph the exterior of their headquarters. Elsewhere, even greater difficulty was encountered; most building owners or street occupants simply refused to be photographed. Taking a photograph which included a bank in the distance, we were chased through the street by a mob, gathered by independent security guards; accused of being a band of white bank-robbers, we were forced to seek refuge within the café of a local celebrity for some hours until this group disbanded. Photographing the Lagos State Police Barracks, having paid a bride to gain the nominal permission of a local policeman, we were nonetheless arrested, and held for 24 hours on suspicion of terrorism. Refused access to lawyers, or diplomatic aid, we were forced to make statements admitting to knowingly breaking the law. We were released the following day on the authority of the Chief Commissioner of Lagos State Police, who confirmed that we had broken no law. However, even he claimed to unable to grant permission for our photographing the building.

These incidents appear connected to the research concerns. At a personal level, and in a context within which suspects regularly disappear while in police custody, they threw us very literally into a gap between law, the codes of everyday life, and sovereign violence. But more generally, we could say that they demonstrate a stark contrast between the norms of the UK, in which laws are transparently available, and in which the photographic documentation of people and things are widespread, and Nigeria, in which laws are practically inaccessible, and an ethics of privacy is observed by individuals, companies and the State itself. This contrast seems significant in understanding the 'relaxed' attitude toward enforcing this specific code; the extent of governmental visibility within Nigeria appears self-consciously limited in relation to everyday norms of privacy.

(Endnotes)

1 Nigeria Under British Rule, 1 edition (London: Routledge, 1965). p. 24

2 Otunba Payne provided this report in a letter to the editor, published in The Weekly Record, cited here in Michael J. C. Echeruo, Victorian Lagos: Aspects of Nineteenth Century Lagos Life (Macmillan, 1977), p.17.

3 Article 1, The Treaty of Cession, 6 August 1861, cited in Taslim Olawale Elias and Nigeria, Nigerian Land Law and Custom (Routledge & K. Paul, 1951) p. 7.

4 King Docemo, speaking at 9pm, on September 12th 1863, as reported by the Anglo-African on September 19th, cited in Michael J. C. Echeruo, Victorian Lagos: Aspects of Nineteenth Century Lagos Life (Macmillan, 1977), p. 17.

5 A statement released by Governor Glover at 6am, September 13th (6 hrs after Docemo's denial) cited in Eceruo, Victorian Lagos, p. 18

6 Kunle Akinsemoyin and Alan Vaughan-Richards, Building Lagos, 1976 Prestige, p. 7

7 Echeruo, Victorian Lagos, p. 20.

8 The Observer, November 5th and 26th, 1887, cited in Echeruo. p. 19

9 The Anglo-African, May 1st, 1863, cited in Echeruo, Victorian Lagos p 19.

10 Kunle Akinsemoyin and Alan Vaughan-Richards, Building Lagos, 1976 Prestige, p. 35-38

11 For an outline of contrasting contemporary interpretations, see Elias and Nigeria, Nigerian Land Law and Custom.

12 Mieke van der Linden, The Acquisition of Africa (1870-1914): The Nature of International Law (Brill Nijhoff, 2016).the responsibility for the past actions of the European colonial powers in relation to their former colonies has been subject to a lively debate. In this book, the question of the responsibility under international law of former colonial States is addressed. Such a legal responsibility would presuppose the violation of the international law that was applicable at the time of colonization. In the 'Scramble for Africa' during the Age of New Imperialism (1870-1914 P. 120-136

13 See "Legal History of Cities" in Gerald E. Frug, City Making Building Communities without Building Walls (Princeton, N.J.: Princeton University Press, 1999).pp 27-32. The section on "the Medieval City draws particularly on Weber's account.

14 Chapter 16 of Economy and Society is titled "The City (Non-Legitimate Domination)". Within that chapter, Weber never actually uses

the term 'non-legitimate' directly. Nonetheless, in his sociological account of numerous city types - from "The Patrician City in the Middle Ages" to "The Plebian City" – he describes the way that particular forms of authority and 'domination' emerge, that are particular to cities, but operate as exceptions to wider, rural patterns of domination; for example - resonating with our study of the Dean of Guild courts in Edinburgh - he discusses the rise of medieval craft association, located within cities, as a means of opposition to ancient territorial units. Likewise, he describes the importance of the 'freedmen', craftspeople and laborers freed from bondages of slavery of serfdom, as an important and specifically urban pre-cursor to the bourgeoisie. See Max Weber, Economy and Society: An Outline of Interpretive Sociology (University of California Press, 1978). pp. 1212-1374

15 James C. Scott, Seeing like a State : How Certain Schemes to Improve the Human Condition Have Failed / James C. Scott, Yale Agrarian Studies (New Haven, Conn. ; London : Yale University Press, [1998], ©1998., 1998).

16 Warren Magnusson, 'Seeing Like a State, Seeing Like a City' (Annual Meeting of the Canadian Political Science Association, Vancouver, 2008), http://www.cpsa-acsp.ca/papers-2008/Magnusson.pdf.

17 Magnusson.p. 8

18 A MacGuffin is a Hitchkockian motif, an empty pretext with which to begin a story: "Two gentlemen meet on a train, and the one is struck by the extraordinary package being carried by the other. He asks his companion, 'What is in that unusual package you are carrying there?' The other man replies, 'That is a MacGuffin.' 'What is a MacGuffin?' asks the first. The second says, 'A MacGuffin is a device used for killing leopards in the Scottish highlands.' Naturally the first man says, 'But there are no leopards in the Scottish highlands.' 'Well,' says the second, 'then that's not a MacGuffin, is it?'". See Slavoj Žižek's The Iraqi MacGuffin, and Everything You Always Wanted to Know about Lacan: (but Were Afraid to Ask Hitchcock) (Verso, 1992).

19 Magnusson, 'Seeing Like a State, Seeing Like a City'. p. 8

20 Mariana Valverde, Everyday Law on the Street: City Governance in an Age of Diversity (Chicago: University Of Chicago Press, 2012).

21 Planning instruments that designate use categories to areas of land are called, in the US, as a result of this case, 'Euclidean Zoning'. The strange coincidence created by this term – between a place name, a legal precedent, and a mathematical theory – is further ramified by the concept of 'non-euclidean zoning'. This term refers to any planning mechanism that does not operate through land-use designations (i.e. through 2-dimensional, flat, or geometrically 'Euclidean' means). For further details see Russell Reno, 'Non-Euclidean Zoning: The Use of the Floating Zone', Maryland Law Review 23, no. 2 (1 January 1963): 105.

22 Mariana Valverde, 'Seeing Like a City: The Dialectic of Modern and Premodern Ways of Seeing in Urban Governance', Law & Society Review 45, no. 2 (1 June 2011): 277–312, https://doi.org/10.1111/j.1540-5893.2011.00441.x.

23 The 'Venice Takeway' project for the British Pavilion at the Venice Architecture Bienale, 2012. I would like a acknowledge the support of the British Council is facilitating this research visit, and Tolulope for his intellectual contribution to it.

24 Tunji Odunlami speaking during an interview with the author, concerning the origin of LSPPD15. Tunji Odunlami, Liam Ross, and Tolulope Onabolu, Interview, Ministry of Physical Planning and Development, Lagos State Secretariat, 2012.

25 Lagos State Government of Nigeria, 'Lagos State Government Notice 8', Lagos State of Nigeria Official Gazette 40, no. 6 (2007).

26 I am referring here to Kafka's existential parable Before the Law, first published as a short story, then included as a story within 'The Trial'. See Franz Kafka, The Trial, trans. Idris Parry, New Ed edition (London: Penguin Classics, 2000).

27 Odunlami, Ross, and Onabolu, Interview, Ministry of Physical Planning and Development, Lagos State Secretariat.

28 I am quoting here from an unpublished report prepared at the request of the author by Akeem Kolawole of Oluwakemi Balogun and Co., Legal Practitioners and Notaries Public, Lagos. This report also informs my concluding reflections on the legal status of the setback and recent challenges to its use. My thanks to Akeem, Kemi, and Ola Oduku, for their assistance here.

29 Kunle Akinsemoyin and Alan Vaughan-Richards, *Building Lagos* (Prestige Books, 1977), http://www.biblio.com/book/building-lagos-akinsemoyin-kunle-alan-vaughan/d/696927305.

30 Akinsemoyin and Vaughan-Richards.

31 LEBD guidelines cited in Kunle Akinsemoyin and Alan Vaughan-Richards, Building Lagos, 1976 Prestige, p. 59.

32 In this phrase I'm again paraphrasing here Prozorov's reading of Schmidt and Agamben. "The paradox of sovereignty is thus the uncanny identity of the foundational and the transgressive" Linking Schmidt's definition of Sovereignty to Agamben's definition of 'potentiality', he suggests that "as a foundational transgression that remains inscribed in the existence of the diagram as its constitutive outside, sovereignty is nothing other than the potentiality for order not to be, its being capable of its own impotentiality". See Sergei Prozorov, Foucault, Freedom and Sovereignty (Routledge, 2016): 86.Prozorov.

33 I base this observation on the above-mentioned report provided by Oluwakemi Balogan and Co. A report on this specific case is available in Bamgbose John Olatokunbo, Digest of Judgements of the Supreme Court of Nigeria: Vols 1 and 2 (Safari Books Ltd., 2013). p. 221,227, 235

5: Tokyo
Spectres of Edo Castle

Fire and historical imagination

5.1
The Historical Pulse of Edo-Tokyo

Cursed Kimono

> Well now, at the hour of the dragon, on the 18th day of the first month of the year of the cock, the third year of Meireki, a wind blew up from the north-west and then became a gale. Dust was blown up into the air and trailed through the sky. It wasn't clear what it was: was it a cloud or not, was it whirls of smoke, or was it a spring mist hanging in the sky? Throughout Edo, rich and poor alike were unable to open their doors; although the day was dawning it was still dark and there was nobody in the streets. Eventually at the hour of the sheep flames suddenly shot up from the Honmyōji, a temple of the Nichiren sect at the western end of Hongō yon-chōme and black smoke raced across the heavens. [1]

So begins the *Musashi Abumi*, an account of the The Great Fire of Meireki, seen through the eyes of the haberdasher Rakusaibo as tries to save his family and possessions from the blaze. The fire took place in 1657, and lasted for three days, destroying two thirds of Edo, claiming over 100,000 lives. Popularly known as the *Furi-sode,* or 'Young-girls-kimono', the blaze is said to have been started by a priest who was cremating a cursed kimono (it had been owned in succession by three teenage girls who all died before ever being able to wear it). As the garment was being burned, a large gust of wind fanned the flames causing the wooden temple to ignite. Few written records of the event exist, mostly in the form of journals kept by European visitors to the city at the time, and the *Musashi* is the only Japanese account (fig. 5.1). Its historical accuracy is limited, the surprisingly comic plot revealing more about the way the populace processed such traumatic events, than it does about the event itself.[2] According to the story, Rakusaibo survived the first day of the fire, returning to his house in the evening to search for his mother. Having identified what he took to be her corpse amongst the crushed and charred remains he gathered his family to mourn, only to be surprised when his mother walked by, very much alive. Initially taking her for a ghost, the families first response to their

mistake is to complain that their prayers for her rebirth in paradise had been a complete waste of time. Drunk from celebrating his family's survival, Rakusaibo awoke the next morning hungover, inside a coffin. He climbed out into a blackened city, engulfed once more in flames, logically concluding himself to be in hell. But upon finding the remains of his family around him, consumed by fire as they tried to wheel him from the city, he realized that he was alive, and that all was lost; he decided to become a monk.

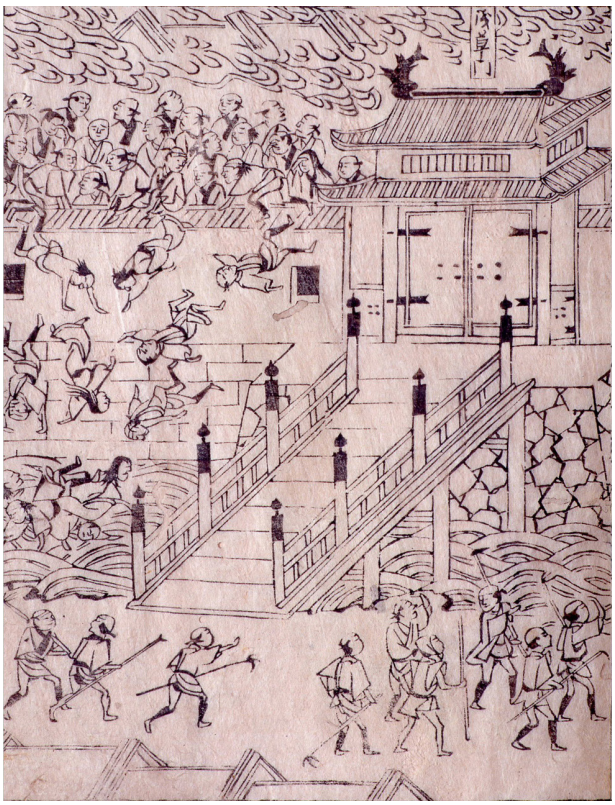
fig. 5.1
Great Fire of Meirecki
Musashi Abumi, Asai Ryoi, 1661.
(Manji 4) New Aquisitions 584
Tokyo Metro Library

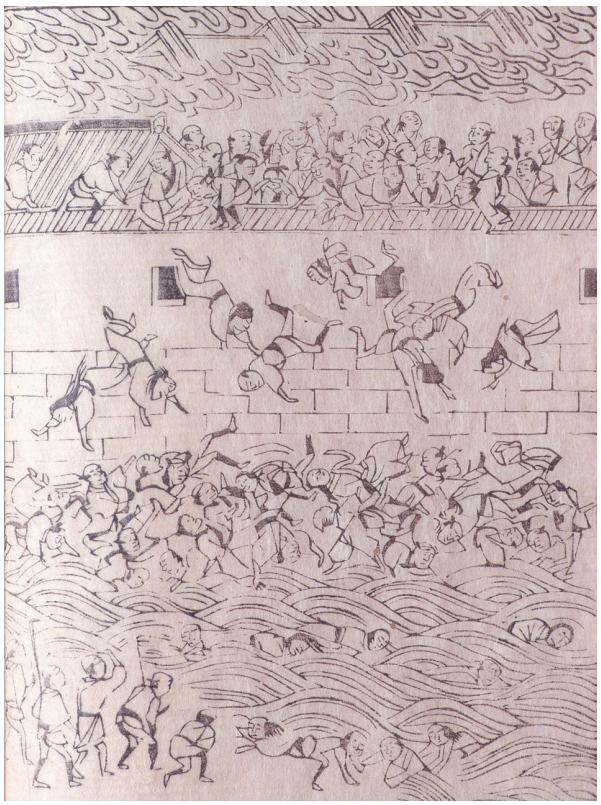
Illustration from the Image shown depicts Asakusa Gate during the Great Fire of Meirecki. The architecture of fire-defense, gates, ramparts and moats, can here be seen turning against the inhabitants of the city, who are trapped by them.

Crock-pots and Char

> The rumbling sound of apocalyptic fires added further terror to it. Screams and shrieks were everywhere, fire burned into an inferno – it was hell.... The big city of Tokyo, the largest in the Orient, at the zenith of its prosperity, burned down and melted away in two days and three nights.[3]

The Great Fire of Meireki was only the first of three events which, over the course of Edo-Tokyo's history, saw the city completely razed by fire. The second was the Great Kanto Earthquake, of 1923, described here by Takashima Beiho. That quake began at 11:58 in the morning, caused by the subduction of the Philippine Sea plate at the Sagami Trough, at the mouth of Tokyo Bay. Accounts of this event are plentiful and detailed; 9000 miles away at the Vienna Institute of Meteorology seismographers confirmed the quake as the most powerful on record, at 8.3 on the Richter Scale. Their charts index graphically what survivor's recount; 15 seconds of violent horizontal juddering, followed by a series of devastating vertical jolts, and over a thousand perceptible aftershocks. The quake generated a 12m high Tsunami, which inundated the port of Yokohama, together leaving buildings destroyed, and infrastructure severed. But the most deadly and destructive aspect of the event was the fire which broke out in its aftermath. Striking at lunchtime the quake overturned cook-pots and spilt char, starting 130 recorded fires within 30 minutes. Fueled by broken service mains and combustible debris, these individual house fires merged into three distinct firestorms which engulfed most of eastern Tokyo (fig. 5.2). An estimated 140,000 people died in those three days, as the infrastructure of the city turned against them. Generating its own winds, the storm moved around the city, consuming what fuel was available; Inhabitants burnt to death or were asphyxiated as their homes became infernos; they were trapped in the streets by molten tarmac; blocked by canals and rivers as bridges burnt down; crushed to death by crowds swelling into squares and open spaces; or drowned in waterways leaping to extinguish burning hair and clothes. The greatest tragedy befell those who made it to the city's largest designated refuge space, the Military Clothing Depot. An estimated 44,000 people died in this location alone, as the storm passed through, bringing an "an enormous wall of fire, like a tidal wave" with air "as hot as melting rock", lifting people from the ground, then depositing their bodies in charred heaps.[4]





Napalm and Fire Brooms

fig. 5.2
Great Kanto Earthquake
'The burned area of Toyooka, Japan, following the earthquake'
Getty Images, https://www.gettyimages.co.uk

> It was March 10, Army Day. It had been rumored that the enemy was planning a huge air raid to coincide with this special day. As if to confirm those fears, a fierce northwesterly wind had been blowing since the previous evening… I went outside to look. In every direction – east, west, south and north – the dark sky was scorched with crimson flames. The steady roar of the B-29s' engines overhead was punctuated by piercing screeches followed by cascading sounds like sudden showers. With each explosion, a flash of light darted behind my eyelids. The ground shook. Flames appeared one after another. As our neighbors looked outside their air raid shelters defiantly holding their bamboo fire brooms, they cursed when they saw how fiercely the fires were burning. They were helpless against the raging flames. Fire trucks, sirens wailing, were already speeding toward the fires, but what could they do in this gusting wind and intensive bombardment?[5]

22 Years later, memories of the post-Kanto fires returned to haunt Tokyo. In the closing years of WWII, with the completion of the US airbase in Saipan, American B-29 Superfortress bombers began aerial bombardment of Japanese cities. On March 10th 1945, in a single run code-named Operation Meetinghouse, 165,000 tons of napalm was dropped on Tokyo. This event - referred to in Japan as the Great Tokyo Air Raid - is the single most destructive air-raid in history, with acute effects greater than the allied bombing of Dresden, or the Nuclear bombardment of Hiroshima and Nagasaki combined (fig. 5.3). As described here through the verbal testimony of Saotome Katsumoto, wind spread the fire through the dense residential districts of eastern Tokyo, destroying 16 square miles of largely working-class housing, again killing around 100,000 people, and leaving over a million homeless. This time, the principal cause of death was not burning, asphyxiation, or the crush of escape. The population took refuge in air-raid shelters, where they suffocated, as the fire-storm consumed all available oxygen.[6]

Blossoms of Edo

History repeats itself, here as tragedy. The story of Edo-Tokyo if often told through this sequence of superlative catastrophes – The Great Fire of Meireki, The Great Kanto Earthquake, The Great Tokyo Air Raid - in which the Feudal, Imperial and proto-modern cities were destroyed in order to be built again. In the mythology of the city they are its source of uncanny vitality; Tokyo the world's largest and most populous city, but also one of its most frequently destroyed, excessive both in life and death. Of course, Tokyo doesn't hold a monopoly on such tragedies; Japan as a whole is closely associated with disaster. Situated on the Pacific 'Ring of Fire', the island is susceptible to volcanic activity, seismic risk, and tsunami; a mountainous country prone to heavy seasonal rainfall, the shape and settlement

of its landscape is scarred by frequent and destructive landslides; synonymous with the Nuclear risk, both as the first and only target for the military use of atomic weaponry, but also of one of the worst civilian nuclear catastrophes, the Fukashima Dai-chi meltdown; marked by strong currents of social and political unrest, through the 'era of popular violence', to acts of cult-inspired terror, such as the Akihabara massacre, or the Sarin Gas attacks. But as evidenced by the brief accounts above, whether the result of urban accidents, 'natural' disasters, or military attacks, fire has consistently proved the deadliest aspect of Japan's most significant catastrophes, and those catastrophes have struck Tokyo disproportionately often. Indeed, beyond and between these three historic fires, countless uncontrolled fires have formed part of the everyday pulse of that city. During the Edo period, from 1601 to 1867, there were a total of 1,798 major recorded fires in the city, compared to the 184 in Japan's second city, Osaka, explaining the popular saying that *Kaji to kenka ha Edo no hana,* (fires and fights are the 'blossoms of Edo'). [7]

fig. 5.3
Great Tokyo Air Raid
'An aerial view of the devastation after repeated incendiary bomb attacks on the city of Tokyo by American B-29 bombers since November 1944'. Getty Images, https://www.gettyimages.co.uk

Disaster by Design

Why has Tokyo suffered from fire more than other Japanese cities? There are, at first glance, some simple reasons; Japan is a country in which almost all houses – from the villager's hut to the shogun's palace - were traditionally made of wood and paper, providing ready sources of combustion; built on an exposed and windy plain, subject to long dry winters, Tokyo is the country's largest tinder-keg, in which sparks spread most rapidly. But this is not the whole story, as it fails to explain the fact that, despite the frequency and severity of fires within the city, Edo-Tokyo is famous for having continued to rebuild itself in largely flammable materials. In the 17th Century, when the use of fire-resistant construction materials – such as plaster wall coverings and ceramic roof tiles - were common in other Japanese cities, they were outlawed in Edo.

Accounts as to why Tokyo continued to rebuild itself in flammable materials vary in their argument. Some have interpreted Tokyo's acceptance of flammable re-construction as a simple lack within its urban governance, ignoring the unique fire-safety legislation that the city had already developed;[8] indeed, as we will consider in this chapter, the urban morphology of contemporary Tokyo is perhaps more fundamentally shaped by fire-safety regulation than that of any other city. Others would offer a cultural explanation of Tokyo's sometimes explicit, sometimes tacit requirement for flammable re-construction, opposing 'western' and 'eastern' attitudes to fire, and explaining the latter through a perceived fatalism inherent to Buddhism;[9] the cyclical destruction of Tokyo would here be caste as a *laissez faire,* secular and urban equivalent of the ritualized and religious reconstruction of the *Grand Ise Shrine.* Indeed, it is compelling to read Tokyo's fire-safety legislature as part of a broader 'culture of catastrophe'. A national susceptibility to disaster reverberates and repeats throughout Japanese cultural products; its mythology, religion, literature and cinema repeatedly engage with

themes of horror and disaster. Vengeful animistic spirits are as common to its Post-war genres of Science Fiction, cyberpunk or J-Horror as they are to its feudal folk-tales. And some would claim that this cultural logic has been extended beyond the sphere of artistic production, into question of policy-making and governance. While no government likes to 'waste a crisis', Japanese history has provided its governors with frequent focusing devices through which to develop and justify programmes of political or moral reform.[10] That fire-resistant construction was outlawed for long periods within the history of Edo-Tokyo, then, might be read as a means to fuel, alongside regular fires, an attendant pulse of urban and political reform. In that sense, the repeated catastrophes of that city's history would need to be read as 'disasters by-design', more-or-less conscious by-products of urban legislative measures.

Tragedy and Farce

History changes from tragedy to farce, we are told, when it repeats itself intentionally. That is, as Marx implies in his famous quip on Hegel - offered in the *Eighteenth Brumaire* – the properly *tragic* occurs only once, when historical contradictions and oppositions surface and unfold in all their necessity, novelty, unavoidability.[11] To construe Meireki, Kanto, and the Tokyo Air Raid as tragedies in this sense, then, we would need to understand them as the working-through of pent-up tensions - those created by economic inequality, seismic energy, and imperialist ambition – whose resolution was nonetheless part of an unfolding enlightenment process. Farce, on the other hand, is characterized by repetition, by events that lack novelty, necessity, or change. It occurs when prior tragedies of are drawn upon and recreated as a means to dramatize contemporary struggles, trapping us within the problems of the past, taking us stumbling backward into the future.[12] Without a transformative dimension, real human suffering becomes tied up within political masquerade.

This chapter reflects on the importance of fire in the history of Edo-Tokyo. As in the previous chapters, it does so by considering the way that fire has shaped the legal and physical fabric of the city. But the specific focus here is the role that fire plays in the *historical imagination* of that city; it considers the way that the experience of past fires has been drawn upon, and become enmeshed within, broader political-economic equations. The concern that prompts this enquiry is the sense of repetition implied by the history recounted above; it is an attempt to understand why a city might regulate so as to re-create fire, as opposed to prevent it. Its ambition, put in Marx's terms, would be to distinguish between the tragic and farcical within this history; to understand how fire might be seen to have contributed to, or stalled, processes of enlightenment.

It begins by studying the 'fire regime' of feudal Edo. It finds that the key aspects of the contemporary city's fire-safety strategy – those of

'land-readjustment' and subsidized fire-safe construction - emerge during this period, as a response to the Great Fire of Meireki. However, it suggests that the failure of these strategies was, in part, by-design; studying the political-economy of Shogunal rule, it finds that fire played an important role, and suggests ways in which the fire-safety policies of this period were intentionally limited. It then moves on to reflects upon this self-limitation theoretically, particularly through the work of Ulrich Beck. In his *Risk Society* analytic, Beck offers his own model of historical transformation, one that likewise draws on the dramatic potential of past tragedies.[13] Through Beck's schema, this section elaborates on the way that risk-mitigation technologies often *sustain* the hazards they are intended to negate. Nonetheless, within the ironies of the 'Risk Society', it will identify a series of processes through which accident can lead to its own kind of enlightenment.

With Beck's terminology in mind, we then return to Tokyo, in order to provide a brief genealogy of that city's fire-safety legislation, from the Meiji Restoration to the present day. Here the focus is on the mutability of the past, and the interpretive flexibility of technology; at stake are the wide range of historical drama's that question of Land Readjustment and fire-proof construction have become enmeshed within. By way of fire, we will see how patterns of class inequality structured by medieval urban legislation are today narrated through an oppositional conflict between 'east' and 'west'. The final section explores the way that this conflict is written in to the urban fabric of Tokyo today. However, it concludes by attempting to see beyond this cultural conjuration. It will suggest that fire is today brokering a different kind of 'cosmopolitanism' within the city, one whose 'other' are the non-human actants of building construction, and their role in shaping the political economy of contemporary Japan.

5.2
Spectral Castles

Consumption City

Edo was formed in 1457 by the Samurai-poet-monk Ōta Dōkan, with the construction of Chiyoda Castle (fig. 5.4). But as Morton Schmorleitz describes, in *Castles in Japan,* it came to national prominence only a century-and-a-half later, when made the seat of power by the Tokagawa Shogunate, the feudal rulers of Japan from 1603 to 1868.[14] At the beginning of this period - the years preceding the Great Fire of Meireki - the city was essentially a fortress and encampment. The castle sat at the mouth of a river (Edo means 'estuary'), on an elevated area of land, two kilometers square, defined by a series of concentric ramparts and surrounding moats. A city in itself, it was divided into numerous internal wards (*maru*) by further walls and canals, and housed the Shogun, his *bakufu* (his military government, literally his 'tent'), and the local *Daimyo* (the nobility, literally the 'big land owners'). Surrounding the castle to the north and west – on dry, hilly land – were the verdant mansion complexes of Japan's other Daimyo, all of whom were required to keep a seasonal home in Edo. To the south and east, on islands made from the sludge dredged from the castle-moats, was the 'floating city' of merchants and tradespeople, a dense settlement of cheap and poorly constructed buildings.

Schmorleitz describes how the physical disposition of Edo was, from its inception, a political-economic diagram whose purpose was "not only to build a capital and castle fitting for the shogun but also to reduce the wealth of the daimyo by making them supply labour, materials, and money for the construction, thereby lessening their ability to overthrow the Tokagawa Dynasty".[15] The *Sankin Kotai* policy, which led to the cities growth by demanding regional nobility to build mansions in Edo, was an important part of this diagram. It established Edo as the nations 'consumption city', at the same time as impoverishing rival nobility and the regions. The physical mass of the castle was also part of this diagram; the castle ramparts, 20 metres high and 16 kilometres in circumference, were not just part

of a military strategy, but also an economic one. The stones for their construction "came mostly from Izu and were transported by ship to Edo, the 3000 ships required being provided by other Daimyo. For each 100,000 koku of income, the daimyo were to furnish 1,120 stones of a size that took 100 men each to handle." "[I]t is said that there were some 300,000 workers employed during this phase of the building".[16] Thus, the castle ramparts were simultaneously a system of need-generation and of taxation which necessitated, funded and organised a nationalised workforce.

fig. 5.4
Edo Castle, Plan
Author Unknown (1854), University of British Columbia. Library. Rare Books and Special Collections.

Plan of Edo castle complex in the Tokagawa era. Note concentric moats (blue) and ramparts (grey), defining concentric wards, or *Maru*. The Donjon is located in the centre of the complex.

Dancing Snakes and Burnable Buildings

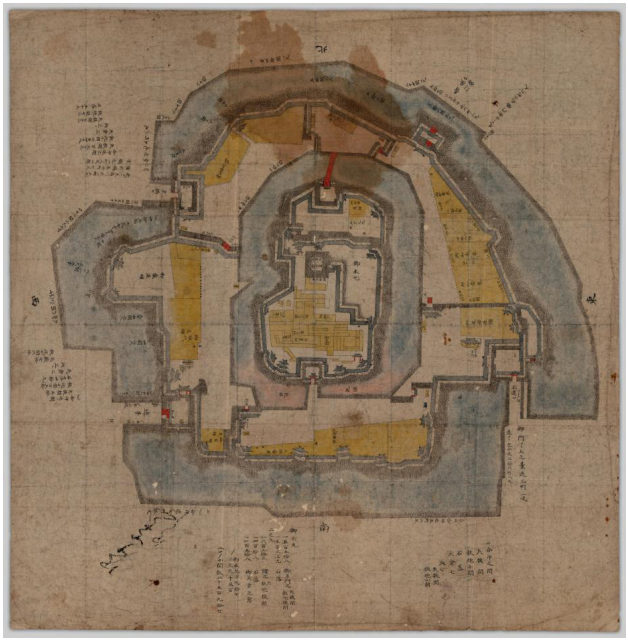
Fire also played an important role in this governmental diagram, which worked not only through the cities construction, but its perpetual re-construction. While everyone from the Shogun to the tradesperson lived in wooden buildings, these buildings differed significantly in terms of fire-resilience. The tenements of the urban poor, for instance, were known as *yakiya*, literally 'burnable buildings'.[17] In an era without piped water, and in which fire-fighting was conducted through preventative demolition, the *yakiya* were built cheaply and simply so as to be quick to demolish, without great financial loss. By contrast, the architecture of the Shogun's palace – the *Donjon* – was rich with symbols, icons and indices of fire-security (fig. 5.5). Its ridges were capped with *Shachikoko* – a Vedic sea monster, a carp with a tigers head – who was seen to provide symbolic protection against fire; its many roofs were covered with ceramic tile, whose wave form and raised eaves made iconic allusions both to the fishes tail, and to waves; its exposed beam-ends were literally and symbolically protected by ceramic caps featuring a wave motif; and its interiors were papered with repetitive patterns that continue the double allusion to scale and wave. Earthquake being the most common cause of fire, the Donjon also featured a number of devices for seismic resilience, indeed the building is recognized as prototypical of contemporary high-rise construction; its timber structure was isolated from its masonry base, allowing it to slip and bounce in the event of earthquake; its un-braced structure was able to sway, reducing the lateral force transmitted upward; its decorative eaves-brackets also isolated one floor from the next, creating two-dimensional slip-planes which further dampened and delayed the transmission of lateral force; its heavy ceramic roof acted as an early form of 'tuned mass dampener', whose inertia limited the movement of the upper storeys; and a central suspended 'column' further dampened this movement, rattling against its adjacent structure. Together, these devices allowed the building to perform a 'snake dance' in the event of an earthquake, whose rhythm interrupted and absorbed seismic force.[18]

fig. 5.5
'Illustration of the Palace Façade of Edo Castle'
From "Materials on the construction of Edo Castle" Tokyo Shiry□ Collection 6191-D3, Tokyo Metro Library

Elevation of Edo castle *Donjon* in the Tokagawa era. Note the masonry base, plaster-covered upper walls, tiled rooves and ridge decoration. Author unknown.

Castle as Urban Paradigm

However, the most important instrument of fire-security for the Shogun and his Daimyo were the moats and ramparts of castle precinct.



Never being subject to military assault, its real defensive value was to ward against the spread of fire from the *yakiya*. Its moats formed a wide watery fire-break, its ramparts a high non-combustible fire wall; its gardens were planted with fire-resistant trees; its *maru* formed effective internal fire compartments; and the soldiers who patrolled its walls were armed not with spears but with fire-brooms. Indeed, we could say that the Tokagawa shogunate approached the problem of fire "on a war footing"; that both the *technologies* and *rationalities* of fire-safety in Edo were essentially military in nature. This argument is made by historians Jordan Sand and Steven Wills in "Governance, Arson and Firefighting in Edo".[19] With the emergent Japanese State and its administration firmly associated with the castle, the concerns of the urban population had not yet come to be considered as governmental problems. Fire was something 'other', which like an invading enemy, had to be kept outside the walls. Where the Shogun did intervene in questions of urban fire, it was in an attempt to develop individual responsibility through criminalisation; Arson was illegal during the period, as was the accidental creation of fire, and even of the failure to put out a fire as it passed through one's property.

What fire represented within this regime, then, was the economic precarity of the urban poor. And in-keeping with other policies of the time, this precarity was consciously constructed. As Sand and Wills argue, the Tokagawa Shogunate had a range of fire-related initiatives, but these were not concerned with *preventing* fire per se; indeed, they note a number of ways in which fire was politically expedient, offering the Shogun an opportunity to demonstrate his sovereignty: public executions of convicted arsonists or failed fire-marshals offered a spectacle of his power over life and death, just as financial aid in post-fire reconstruction was also an opportunity to demonstrate compassion and largesse, and so justify feu duties and target economic stimulus. But perhaps most importantly, the aftermath of a large fire allowed him to re-partition land-ownership, and so to re-design the city, reminding townspeople and nobility alike of their feudal dependence upon him. And fire was also an ambivalent phenomena for the townspeople, too. Arson was widespread; for a destitute tenant, with rent in arrears, burning down the house was a way to write-off debt. That is, fire was a non-human actant within the drama of feudal rule, one which was employed by the shogun to sustain his limited autocracy, but also by the poor to navigate a circumstance of urban precarity.

Indulgence and Poverty

It is from this perspective that I think we can understand the historical significance of the Great Fire of Meireki. The fire effected what might be construed as a kind of non-human political insurrection, undermining the authority of the Castle, both literally and metaphorically. The scale of the blaze in the surrounding encampment was such that sparks and embers were carried over the moat and walls, beyond the reach of the soldier's fire-brooms, igniting the tim-

ber buildings within. Fire engulfed the whole of the castle complex, destroying the palace, its temples, and the central keep. It marked the end of Chiyoda as a military base proper - its central keep was never to be rebuilt. But its broader historical significance is that it challenged the 'castle-town' mentality of the Bakafu's fire-regime; the scale of property loss within the town was such that it exceeded the capacity of the Shogun to fund reconstruction, and so weakened the Shogun's position as opposed to strengthening it. After Meireki, the problem of urban fire could no longer be considered as properly 'outside' the concerns of government. Response to the fire was led by Rōjū Matsudaira Nobutsuna, one of the Shogun's leading *Daimyo*, and its effect can still be read on the city today. Nobutsuna used the event to radically extend and de-densify the footprint of the city, relocating townspeople and nobility alike. The remaining *daimyo* were moved out of the castle, and allocated new estates forming a ring to the north and west of castle, beyond the outer moat. The encampment of tradespeople was moved to the east, creating a large clearing between the Castle and the Town. The canals of this area were used to break-up this accommodation, and Nobutsuna also proposed a series of fire-breaks, in the form of walls and clearings, dividing the eastern part of the city into Wards. [20]

No efforts were made to enforce the use of fire-proof materials in the re-construction of the town, though, indeed Nobutsuna went so far as to make fire-proof roofing illegal in Tokyo at this time. To understand the logic of this one must understand the importance of sumptuary law in feudal japan. [21] As Donald Shivley explains in *Sumptuary Regulation and Status in Early Tokugawa Japan* the legislation of 'indulgence' was, in many ways, the key governmental rationale of this era. Such laws limited expenditure on 'luxuries' according to social class, allowing the *Daimyo* to indulge more expensive tastes than farmers, for instance. Expenditures considered luxurious extended to matters of architectural design; indeed, the features of Japanese vernacular architecture – including ridge ornaments, decorative alcoves (*tokonoma*) and specific modes of detailing eaves-ceilings (*segai*) – all played a part in this symbolic ordering of wealth and status.[22] Shivley recognizes a relationship between fire and sumptuary law; the immediate aftermath of fires often provided the opportunity and perceived necessity to re-regulate. For instance, in the immediate aftermath of the Meireki fire, Shivley notes that tile roofing was immediately banned, even for the *Daimyo*.[23] But I think it is possible to argue that this sumptuary law also structured the likelihood of future fire. As we have seen, the architectural symbolism of wealth was often closely allied to it fire-resistance; ceramic roof tiles were understood to pose a risk in the context of fire-fighting by demolition, but they were also deemed an 'extravagance' for the urban poor, a financial loss they could not bear. As such, this regulatory system had the concrete effect of sustaining the class divisions that it sought to represent.

The Castle is Dead; Long Live the Castle

While the Great Fire of Meireki brought about a significant change in the *rationalities* of fire-safety in Edo, with the Bakafu beginning to recognize a need for spatial interventions in the fabric of the city to limit spread of fire amongst the townspeople, this was not achieved through novel fire-fighting *technologies*. Rather, Robutsano continued to work with the fundamentally military techniques that had previously comprised the safety of the Castle. The canals, walls, clearings and fire-districts he proposed across the city effectively reproduced the castles architectural features at the level of urban design. So, while the fire undermined the fortress castle in one sense, spelling the end of its governmental and physical autonomy, it also gave it an uncanny afterlife, with the city as a whole being reconceived through a network of moats, ramparts, clearings and wards (fig. 5.7).

As again explored by Jordan Sands, in "Property in Two Fire-Regimes: From Edo to Tokyo",[24] this intervention complicated the relationship between the two distinct 'property regimes' we described above; the fixed and defensive capital of the 'castle' and the mobile and disposable capital of the 'town'. In effect, these two regimes became intermingled, the former seeking to spatially contain, and protect, the latter. But as Sands recounts in detail, attempts to distribute the 'castle' across the town were fraught with difficulties. On the one hand, the scale of such an intervention was beyond the scope of the Shogun to realise or enforce autocratically; walls and canals were expensive, and while clearings could be made easily – through compulsory re-partitioning of land - they were quickly filled in by illegal settlements.[25] By the beginning of the 18th Century, this prompted Tokagawa Yoshimune to overrule the previous edict banning fire-proof materials, and to begin what would be the first of many attempts to convince Tokyoites to re-build their homes in fire-proof materials. But Yoshimume's scheme – which involved partial subsidy for the use of plaster and tile – were of limited effect, for apparently paradoxical reasons, explored by the economic historian Lionel Frost: landlords and tenants complained that they could not afford to invest in expensive, fire-safe construction on account of the losses they had accrued through previous fires. The ever-present risk of fire created such precarious condition for investment, that it thwarted longer-term planning or investment. That is, the way that fire had been enrolled within a political-economy of indulgence had constructed in Tokyo something of a prisoner's dilemma, which neither individual nor government appeared able to escape.[26]

Fire, the original consumer

Reading between the accounts of Schmorleitz, Shivley, Frost, Sand and Wills, I think it is possible to see this predicament as highly consequential, not only for the urban fabric of Edo, but also for Japanese legal and aesthetic cultures more broadly. During this period in Edo, the organizing dynamic of fire-risk seems to sediment in a

range of ways, connecting questions of social class, urban design, the legal status of property, economics of investment, modes of construction, and architectural style. Through sumptuary law, architectural devices for fire-safety had already become enmeshed within the construction of a symbolic order, and a political economy, of the ruling class, limiting investment in fixed capital. Indeed, the Shogun advised tenement landlords to calculate for a return on investment within 6 years, and so housing was cheaply built, and occupied a minimum footprint.[27] The construction industry that developed around these concerns was focused on ensuring the minimum use of material, and the maximum speed of supply-chain. Tokyo's *Yakiya* came to be built of timber post-and-lintel construction, secured without metal fasteners, based around standardized component sizes determined by Tatami; the celebrated modularity of Japanese architecture. The opportunities for profit for building owners and construction companies were, in this model, based upon volume and turnover, and while fire limited return on investment it nonetheless guaranteed continuity of demand.[28] Or to put it another way, the economy of the *Yakiya*, and so of Tokyo more broadly, were based upon the continued *consumption* of buildings, rather than investment in their durability.[29] Like supplies for the Shogun's seasonal parties, buildings were another disposable commodity which Tokyo needed a constant supply of; items of mobile capital, whose structural frames as well as modular fixtures were capable of being dismantled and moved to other locations as and when was required.[30]

Phenomenology of Law

This notion of building as something mobile and consumable –as opposed to the finite fixity of Land – also sedimented legally. Land and property were legally distinct in Edo, seldom owned by the same people, and often overlapping; it was possible have legal rights to the use of a building that sat on land owned by others, or straddled multiple land-ownership boundaries, just as it was possible to own land without having any rights over the buildings standing upon it.[31] This property regime, in itself based upon a certain response to fire-risk, nonetheless worked against Yoshimune's attempts to incentivize investment in fire-safe construction. Tiles, masonry and plaster, and excavated basements; these materials are phenomenologically grounded; they are *made* of the ground, as well as being heavy, fixed, immoveable. They not only posed a danger during demolition, they also work against mobility of capital. To support investment in such construction practices therefore required changed practices of property ownership and investment, changes that would not originate out of a concern for public safety, or the preservation of property value.

The developments in fire-safety practices in the remainder of the Edo period were led by a coalition of interests that developed between the Shogun, an emerging merchant class, and the urban precariat, over the question of how to secure high-value items of mobile capital against fire-risk. The poverty of Edo's working class was

such that it could not afford the risk of owning basic commodities – futons or mosquito nets – while they were not in use, and so almost all belongings were leased or pawned seasonally. This created the need for storehouses in which these goods could be secured from fire-risk. Likewise, merchants required shops and storage facilities in which stock was kept safe from fire. A new building typology emerged to service the needs of these constituencies, the *dozu zukuri*, or storehouse.[32] These were the first buildings to feature significant fire-safety features; their walls were made of plaster and mud, their doors and windows were designed to be sealed seasonally with plaster, and their foundations included cellars (indeed these buildings were known colloquially as 'godowns'). These buildings were not simply a physical innovation, but also a new legal vehicle. The shogunal registers of land and buildings made no mention of moveable timber buildings, but the *dozu zukuri* were noted, being understood less as buildings, more as an 'improvement of the land'. Thus, without undermining an economy based upon rapid consumption of moveable capital, a different urban order began to emerge within the *Yakiya*. The urban pattern of Edo began to develop – as demonstrated by reconstructions at the Edo-Tokyo museum – in the form of wide commercial streets, peppered with fire-resistant shops, pawnbrokers and storehouses, creating lines of defence within an otherwise perishable, timber city (fig. 5.6).

fig. 5.6
'A diorama depicting a scene of the bustling life during the Edo period'
Edo Tokyo Museum Source: www.toki.tokyo

A diorama at the Edo Tokyo Museum, depicting a street scene during the Edo period. Commercial storehouses, the *Dozu Zukuri*, are shown to line the major streets. These buildings are permitted to use the fire-proofing strategies common to the Donjon - plaster walls and ceramic roof tiles (seen here in grey) - along with associated decorative schemes. The timber *yakiya* line the lesser streets, and are constructed from timber (seen here in beige).

Reflexive Limitation

I have dwelt here at length here on Edo's Tokagawa-era fire and property regimes not because I can offer anything novel to the existing historical material on this period, but rather because the purpose of this chapter is to trace the shadow they cast across the city's future. In the third section, I will seek to show that, despite many attempts to reconstruct the city throughout in fire-proof material, something like a 'castle-town' mentality has been repeated by 19th and 20th century reconstruction plans. What I wish to argue here, on the basis of the accounts if have drawn upon, is that the problem of fire in Edo does not seem to be sustained due to a simple *lack* of fire-safety legislation, nor through an identifiable fatalism, or an active desire for reconstruction; rather it seems to be sustained by a constitutive limit within the existing technologies of fire-safety. That is, I wish to suggest that the policies of land-readjustment and fire-safety promotion developed during this era actually sustain, as opposed to mitigate, the threat of fire.

My argument is simple: when futons and mosquito nets are distributed in houses across the city they cover a lot of ground. When they are gathered together in store-rooms, they cover much less. It is not possible for stored futons to surround the space they will occupy when re-distributed. As such, it is not possible for the *dozu-zukuri* to protect the *Yakiya*. And this spatial problem also has an economic logic. The pawn-shops and store-houses of feudal Edo could not provide an infrastructure of fire-safety for another, parallel reason. If the physical mass and disposition of these buildings were to over-

come the problem of urban fire, they would also undermine their commercial base; the urban poor would be able to keep their futons and mosquito nets, having overcome the need for such storehouses. That is, I want to suggest that fire-safety provides something like the condition of impossibility for Edo's govern-mentality, the thing which it seeks to outlaw, but must nonetheless sustain.

fig. 5.7
Urban Moats in Contemporary Tokyo
Liam Ross / Google Maps

The Konaki River, part of a network of canals subdividing the district south-east of the castle, planned after the Meirecki fire as urban fire-breaks. Note the greater proportion of high-rise, reinforced concrete buildings which today flank this and bisecting canals. Kiyosumi Garden, lower left, and Saru Onshie Park, upper right, are designated fire-safety refuges.

fig. 5.8
Urban Ramparts in Contemporary Tokyo
Liam Ross / Google Maps

The Omotesando superblock. Note the higher proportion of high-rise, reinforced concrete commercial buildings along the main 'Global' road, Jingu-Mae, with low-rise, dense housing in the interior of the block, accessed via 'Local' roads and alleys.

Fortified Village

It is with this set of relationships in mind that I wish to cast briefly forward to the contemporary scenario, because for anyone familiar with present-day Tokyo, this description of medieval Edo will sound surprisingly familiar. Unlike western cities, density in Tokyo does not cluster toward its centre, but is rather distributed, surrounding and defining large urban wards known as 'superblocks' (fig. 5.8). These large urban wards comprise the cities fire-safety 'wards'. They are defined by tall, reinforced concrete buildings, for commercial programmes, which are permitted along major road arteries so as to incentivize fire and seismic-resilient construction. However, the majority of the population still live in low-rise cheaply built timber buildings that fill the interior of these new contemporary *Maru*. And these buildings are still remarkably short-lived. Where the Shogun offered a 6-year estimate, the Japanese Land Ministry today recommends that investors anticipate a 30-year life-cycle for new construction.[33] The city is a series of 'fortified villages', surrounded and separated by castle-like fortifications, moats, and parks.[34]

This morphological continuity is not carried by physical traces; the city has been destroyed and re-built may times in the intervening period. That is, if Tokyo in the 21st century remains surprisingly similar to Edo in both material and spatial character, it is not on account of the persistence of its built fabric, but rather of its 'fire-regime'. And if this regime brings with it a kind of spatial continuity, it likewise carries with it a reflexive limitation in govern-mentality. Just as the *Dozu-zukuri* only lined a small proportion of streets, in the commercial centre of the city, so Tokyo's superblock morphology only becomes legible in certain circumstances, where land-value and commercial activity justify high-rise corporate buildings. In the majority of the city - the peri-urban sprawl where residential development reaches its greatest density - there are no urban fire-safety measures. That is, Tokyo is still re-building itself in a highly flammable arrangement, one that is justified governmentally by a fire-safety rationale that is geometrically inadequate to the scale of its demand.[35]

5.3
Haunted by 'Risk'

Risk and Reflexivity

In his seminal engagement with the subject - *Risk Society: Towards a New Modernity* - the sociologist Ulrich Beck argues that 'Risk' is the most important conceptual tool through which to understand, and to shape, processes of contemporary social transformation. Beck makes this assertion with a range of late 20th and early 21st Century concerns in mind - from the nuclear risk and environmental crisis to terrorism - suggesting that questions of hazard and safety have come to play a dominant role in the governing-mentalities of advanced industrialised societies. He presents his argument as an historical descendent of, and replacement for, Marxist problematics and analyses. While the problems and conflicts of early industrialised societies might be seen to have been caused by unequal distributions of *wealth*, and to have been shaped through concepts such as class solidarity and struggle, the ontological base of such issues - that of material scarcity – has, for Industrialised societies, been replaced. In a context in which that scarcity has been overcome, political problems increasingly originate through unequal distributions of *risk,* and operate through rationalities and technologies of 'safety'.

For Beck, along with colleagues Anthony Giddens and Scott Lash, this change in governmental focus bring with it a new historical dynamic, one which they characterize through its *reflexivity*; Beck's 'Risk Society' analytic forms part of a broader theoretical framework, defined in *Reflexive Modernisation*.[36] At its first level of iteration, the reflexive character of this period is quite simple: Just as Marx had suggested that the emergence of Industrial Capital was a means to work through the inequalities and contradictions of previous political-economies, so Beck *et al* invite us to see the problem of 'Risk' as the surfacing and working-though of the inequalities and contradictions of industrialized capital. The problems we encounter in developed capitalist economies – from environmental degradation, to concerns over the health and safety of the population – are not 'ex-

ternal' or 'natural' problems, but rather the manufactured side-effects and unintended consequences *of* industrialization, which return to haunt us. When our governmental focus shifts to concentrate on Risk, Beck suggests, we enter into a new phase of modernity, one in which industry itself is no longer the motor of 'rationalisation', but rather the thing which in turn needs to be rationalized. This period is 'reflexive', then, in that the process of modernization turns in on itself, becomes tied up in self-referentiality and feedback.

The Back Stair of Side Effects

But this simple observation leads to a complex circularity of cause and effect, one which can be outlined through the biological trope of Beck's metaphor. A 'reflex' is an action performed without conscious thought; the patellar reaction of a knee struck by a mallet, the start of a person when startled. Beck uses this metaphor to describe, at a sociological level, the 'involuntary' nature of contemporary historical change: he suggests that the governmental problems of reflexive modernity are no longer defined by a coherent agenda, but rather appear as ad-hoc responses to emergent crises. Our governmental mechanisms for assessing, mitigating against and compensating for pollution or work-place accidents, for instance, are problems and mechanisms which have emerged as a by-product of industrialised production. While they may be inspired by concerns over social justice they do not – contra Marx - bring with them any alternative or revolutionary momentum, because these governmental problems and solutions are so closely allied:

> The basic insight lying behind all this is as simple as possible: everything which threatens life on this Earth also threatens the property and commercial interests of those who live from the commodification of life and its requisites. In this way a genuine and systematically intensifying contradiction arises between the profit and property interests that advance the industrialization process and its frequently threatening consequences, which endanger and expropriate possessions and profits.[37]

Within reflexive modernity, then, history itself takes on a kind of involuntary dynamic, emerging from and leading to accident. Indeed, in Beck's thesis on reflexive modernity, the question of the side-effect – the organizing motif of this dissertation – takes on a central role, becomes in fact the 'motor' of history. As he puts it;

> Industrial society exits the stage of world history on the tiptoes of normality, via the back stairs of side effects, not in the manner predicted by the picture books of social theory.[38]

Knee Jerk Reactions, Sympathetic Shrieks

But side-effects are not necessarily unintentional; indeed, they can be induced. Our reflex reaction can often be employed to dramatic

effect. As in the sympathetic magic of horror movies, religious cults or illness, the sound of a shriek can often induce a shriek, the faint of a sayer a mass fainting spell, or the smell of vomit, sickness. The problems and potential of reflex action are well understood, for instance, within the insurance industry, where they form part of the phenomena known as 'Moral Hazard'.[39] Insurers recognize that risk is subjective, and that in many cases insurance *against* a specified hazard has the effect of *increasing* its probable frequency or severity. If I take out fire-insurance on a dilapidated and vacant property, for instance, there is a high 'moral hazard' that I might be tempted to burn it down myself; beyond feudal Edo, suspected or convicted arson plays a significant role in the assessment of fire-insurance claims. Likewise, if I ensure my smartphone against loss, I become statistically more likely to lose it. This reflexive problem creates a wrinkle for the moral subject, and the actuarial scientist; what objective data can be drawn upon to assess the likelihood of an event, if the act of assessment itself will change that likelihood? And if others expect me to behave dishonestly, include that in the calculus of Risk, can I really expect honesty of myself? This problem resembles closely the predicament of the urban poor in Edo, unable to assume individual responsibility for urban-fire-safety, because they expected other not to. However, as we saw, such phenomena also pose an opportunity for medieval pawn-brokers, as they do for contemporary insurers; by increasing risk through the supply of cover, the insurance sector creates a feedback loop of accidental need-generation, whereby supply increases demand.

Such phenomena have likewise been identified at the level of government. As both Foucault and Ewald have both suggested, the transformations in the role of government in post-war Europe and America – whereby the state came to take an increased role as social insurer and care-taker of the populations health and well-being - can be described as an engagement, by government, in actuarial rationalities.[40] Where this began through projects of nationalized risk-spreading ('technologies of solidarity', in Ewald's terms) supported by the experience of industry and mechanized warfare, this governmental project soon encountered its own forms of 'moral-hazard'; that an increased scope of governmental action might construct an increased dependency. This reflexive logic underlies, for instance, populist outrage over 'dole dependancy' and 'welfare scroungers', but we might also see it in criticism of neo-liberal privatization, where a dependency on rhetorically 'free' markets are seen to be structured through state-mandated but privately provided services.[41]

That is, in Beck's view, the political-economy of Risk is one which, while offering local mitigation, can never overcome the source of a hazard, nor the broader historical tensions this might belie. Indeed – like the sympathetic generation of a cold-sweats, or an induced mass convulsions – govern-mentalities of 'risk' can often seem to systematically increase both:

> Risk production and its cognitive agents – critique of civilization, critique of technology, critique of the environment,

> risk dramatization and risk research in the mass media – are a systemimmanent normal form of the revolutionizing of needs. With risks the economy becomes self-referential, independent of its context of satisfying human needs…in this way, the risks must grow, they must not actually be eliminated as causes or sources. Everything must take place in the context of a cosmetics of risk, packaging, reducing the symptoms of pollutants, installing filters while retaining the source of the filth. Hence, we have not a preventive but a symbolic industry and policy of eliminating the increase in risks. The 'as if' must win and become programmatic.[42]

The Spirit of (reflexive) Modernity

In Beck's account, the reason that the economies and govern-mentalities of reflexive modernity transcend material need is that, by organizing themselves around a concern for Risk, they take on a metaphysical dimension. Risk is, of course, fundamentally virtual: it is not the reef upon which our hopes are dashed, but the *likelihood* of ship-wreck; [43] not the catastrophe itself, but our "*anticipation* of catastrophe".[44] And in addressing itself to this virtual foe, the govern-mentalities of reflexive modernity learn something from the sooth-sayer, the shill-man, the confidence trickster, developing something like a cult of the supernatural. In the Risk Society:

> The role of the spirits would be taken over by invisible but omnipresent pollutants and toxins.. even where they approach us silently, clad in numbers and formulas, risks must be believed, that is, they cannot be experienced as such… New communities and alternative communities arise, whose world views, norms and certainties are grouped around the center of invisible threats.[45]

The conjuration of invisible threats – be they pollutants or jihadists - is a powerful tool for governmental dramatization.[46] But in order to make use of that tool - for these spirits to work – risk must to be given concrete form. In order to construct positions of power and authority in the Risk Society, Beck suggests that it is not necessary to actually *reduce* the hazards of modernity (indeed, as we have seen, these hazards may indeed be politically expedient); what is important is to develop tools for *representing* those hazards, dramatizing them, submitting them to calculation. What the term 'Risk' names, properly speaking, is neither the hazard, nor our uncertainty, but only the mechanisms through which both can be submitted to probabilistic accountancy; whatever cannot be calculated, cannot therefore be speculated on, and cannot therefore be a 'risk'. It is through this logic that, today, authority claims often sediment in technocratic and bureaucratic practices – from quality assurance procedures to mortgage refinance mechanisms - that in a slight of hand both banal and magical, transfigure absolute uncertainty into mathematical probability.

Homeopathic Irony

This observation brings us to an over-arching irony that Beck associates within the Risk discourse: that by looking for mechanisms through which to dramatize the potentiality for harm, our technologies of risk mitigation tend to focus on those hazards that most readily submit themselves to calculation, typically those that have happened in the past. As such, they necessarily ignore the more serious sources of hazard; those unforeseen threats which have never occurred, and of which we know nothing. At its broadest, then, the *reflexivity* that Beck describes is one of being captivated by past tragedies, which as opposed to preventing, we develop means to profitably sustain:

> The narrative of risk is a narrative of irony. This narrative deals with the involuntary satire, the optimistic futility, with which the highly developed institutions of modern society - science, state, business and military - attempt to anticipate what cannot be anticipated.[47]

Beck's analysis can, at times, seem resigned to an apathy in which irony begets only more irony; "[our] knowledge of the Irony of risk suggests that the omnipresence of risk in everyday life should also be treated with sceptical irony. If irony were at least the homeopathic, practical antidote to world risk society...".[48] But nonetheless, his argument traces something like an 'enlightenment' process occurring through such transformations. Echoing Latour's supports of the democratic debate that has emerged around controversies of science and technology, Beck notes the emergence of a global public discourse associated with the dissemination of risks. In public dissent over the consequences of technological activity, he sees something like a process of "involuntary enlightenment", through which we come to learn about things we didn't really want to know, that are forced upon us by accident.[49] And through that process, Beck suggests that the Risk society is typified by a kind of "enforced cosmopolitanism".[50] Through risk, we witness the return of externalities and 'others' excluded from the calculus of capital; those populations endangered by climate change, inspired to terrorism, the troubling persistence of toxins, or nuclear isotopes. As industrial culture adapts to recognise those 'others', it achieves an impure but actual form of cosmopolitanism.

> The experience of global risks is an occurrence of abrupt and fully conscious confrontation with the apparently excluded other.... The distant other is becoming the inclusive other - not through mobility but through risk. Everyday life is becoming cosmopolitan: human beings must find the meaning of life in the exchange with others and no longer in the encounter with like.[51]

Polyvalent Risk

Beck's Risk Society analytic is not without its detractors, some of

whose commentary we have already touched upon. Pat O'Malley, whose work we will engage with in the next chapter, would caution against generalising as to the social effects of this specific concept.[52] And the work of the Aggregate Architectural History scholars, and their project 'Archiving Risk', likewise speaks to the plurality of rationalities and technologies to which this term has been attached.[53] Latour has also commented on Beck's work, expressing a concern that – while offering a powerful meta-narrative to the contemporary critique of technology – its periodization reinforces a false opposition between 'modern' and 'pre-modern' world-views.[54] The work of this dissertation, charting the range of effects and concerns to which the technology of fire-safety legislation has become attached, should contribute to that sense of caution. Nonetheless, without subscribing to Beck's periodization, I would like to suggest that some aspects of his analytic are useful for, and can be applied to, our analysis of Edo-Tokyo.

To understand what fire signified for the inhabitants of medieval Edo, we have had to think in terms of not only differential wealth positions, but also risk-positions; to construe the Great Fire of Meireki as a form of non-human political insurrection, we have already engaged with a kind of accidental historical process; to understand the politics of feudal sumptuary law, we have considered the reflexive nature of risk, its susceptibility to design, and to induction; and in considering the actions of townspeople who burn down their own houses, and shoguns who let them, we have considered a government and populace in the grip of 'moral hazard'. Most importantly, by reflecting on the way that feudal fire-safety policies tied their realisation to an emergent merchant class, we have seen a genuine and systematically intensifying contradiction arising between profit and property interests, and their life-threatening consequences. In the following section, we return to Tokyo in order to extend this dialogue with Beck. Through a brief genealogy of urban fire-safety initiatives within the city I wish to do two things: First I wish to consider the kinds of historical learning that have, and haven't occurred with respect to fire in the city; second, I wish to think about how fires have brought the city into a sometimes supportive, sometimes oppositional relationship with a range of 'others'.

5.4
Repeating Mistakes

Haussmann in the Village

The Edo period came to an end with the Meiji restoration of 1868, when Shogunal rule was overthrown, and Imperial administration began. Edo the city also ceased at this moment, becoming Tokyo, the Imperial Capital. And that change brought with it a set of concerns that would link the problem of fire, and those of fixed capital investment, to that of internationalism. The prevalence of fire was recognized as a barrier to foreign investment, and through plans to re-design Tokyo as an Imperial capital, its fire-safety became a rhetorical, and western-looking ambition.[55] Perhaps the most spectacular example of these plans was again prompted by fire. In 1872, a major fire destroyed Ginza, the mercantile centre of the city. The administration commissioned an English architect, Thomas Waters, to re-design this district - which led from the commercial port to the castle - in a western style. Ginza's 'Bricktown' therefore acted as gateway and advertisement for foreign visitors, and investors. But it generated mixed feelings amongst the local; "everyone wanted to look at it, but not many wanted to live in it", as the cramped building were considered stuffy and damp, ill-suited to a monsoon climate. [56]

Nonetheless, Ginza offered a model through which to develop wider plans. Highly consequential to these was a state visit to Europe, during which the administration was inspired by Haussmann's city of broad boulevards, and regulated facades. In 1886 they invited Wilhelm Bockman and Herman Ende to Tokyo, and commissioned them to prepare a design for the capital, one of ceremonial, axial boulevards. But this first 'grand design' came to an abrupt halt; the scheme was abandoned as too costly, due to resistance from land-owners, and through an emerging cultural backlash against imported concepts.[57] The preferred alternative to Bockman and Ende's plan was the 'First Plan for Urban Improvements of Tokyo'. This plan also proposed a network of new, fire-safe new streets, carving through the dense, flammable fabric, but was more modest in extent. It likewise looked to Haussmann, from whom it took an

urban law, facilitating the state expropriation of land along the edges of newly created streets (fig. 5.9). However, despite being adopted into Japanese law - as the Tokyo Urban Improvement Ordinance of 1888 – the plan was likewise never enacted. Where redevelopment did occur during the Meiji period, it happened in a piecemeal fashion, prompted by urban fires, and with quite different results. Following the logic of feu re-distribution after city-wide fires, practices of 'land readjustment' continued during this period. Without compulsory purchase by the state or organized capital, agreements were brokered with individual land-owners to accept a reduction in plot-size so as to facilitate new or widened access infrastructure. Since fire struck mostly within the dense centre of urban wards, this form of development did not support the creation of wide urban axes, but rather the further subdivision of the already dense 'village'.[58] The failure of this first plan was such that, while Tokyo's planners were looking to the West, Paris and Tokyo were still a long way apart. Indeed, in the eyes of Paul Claudell, French ambassador at the time of the Great Kanto Earthquake:

> Tokyo and Yokohama were not cities but huge villages, indefinite areas of dry wooden shacks separated by narrow paths. Those two cities burnt like a construction site or a forest burns. Nothing was planned to prevent the fire propagation.[59]

fig. 5.9
"Urban reform plan in Paris in 19th-century by Georges Haussmann"
Author unknown. Extract from Sekizawa, Ai. 'History of Urban Disaster Preparedness since Meiji-Era 1868 to the 1923 Kato Earthquake'. Tokyo Graduate School of Global Fire Science and Technology, Tokyo University of Science, 21 October 2016.

A Japanese illustration of Haussmann's boulevard proposals, and the mechanisms of state expropriation they entailed.

New Tokyo, Ad-Hoc Tokyo

That earthquake undermined Meiji-era thinking on pyro-seismic design, destroying the district of Ginza again, in its entirety. It's western looking, masonry architecture was not only damp, but also brittle. But the Kanto earthquake did lend support to other euro-philic ambitions. As described by Carola Hein, Professor of History of Architecture and Urban Planning at TU Delft, the Kanto Earthquake and reconstruction suggests that this event was seen as a 'golden opportunity' to import planning principles that had been developed in Europe and the US. The quake struck only four years after the enactment of the 1919 *City Planning Law*, and it allowed Shinpei Goto, a leading urban planner who was also Mayor of Tokyo and then minister for the interior, to develop his *New Tokyo Plan*. That document embraced a range of ambitions then common to western planning discourse; the combination of urban and economic planning, speculation on population increase, ambitions for de-centralisation, social housing, increased public spaces and amenities, as well as coordinated visual control of the streetscape. But this comprehensive plan was again abandoned, in favour of the *Ad Hoc Town Planning Law* of 1923. The two principle vehicles that this law supported were the *Imperial Capital Reconstruction Plan for Tokyo City*, of 1923, and the *Earthquake Reconstruction Land Readjustment Project*, of 1927. Again, both cited the risk of fire, and the need to develop a fire-resilient urban pattern, as the key concern for the reconstruction of the city (fig. 5.12-13). However, neither suggested the widespread use of fire-proof construction materials, nor planned construction projects, rather they formalised already established practices of plot adjustment to facilitate the creation of

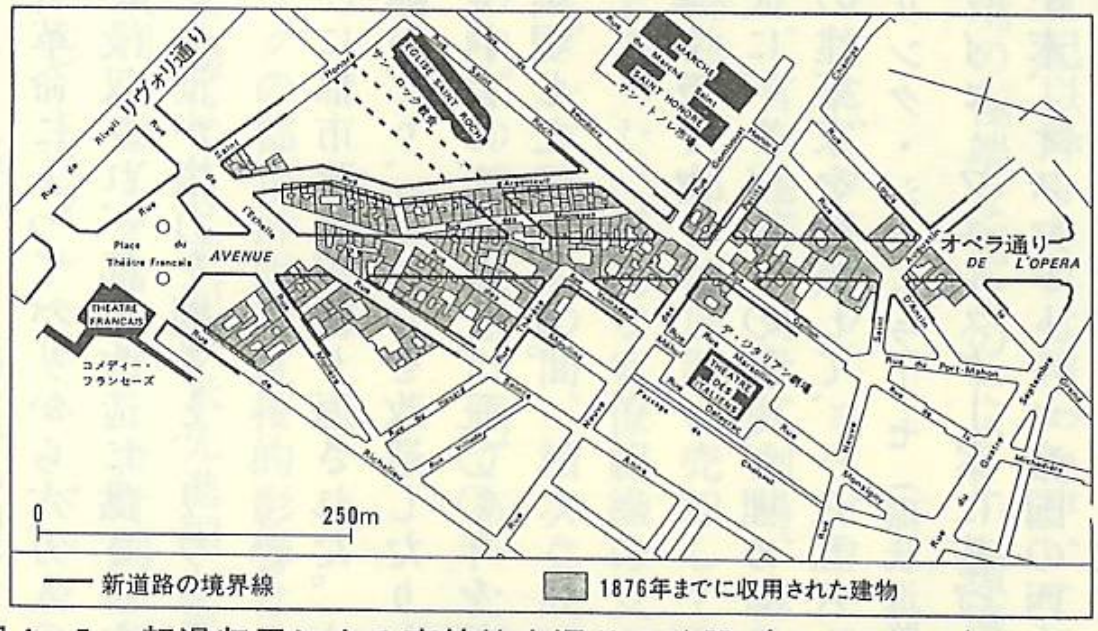
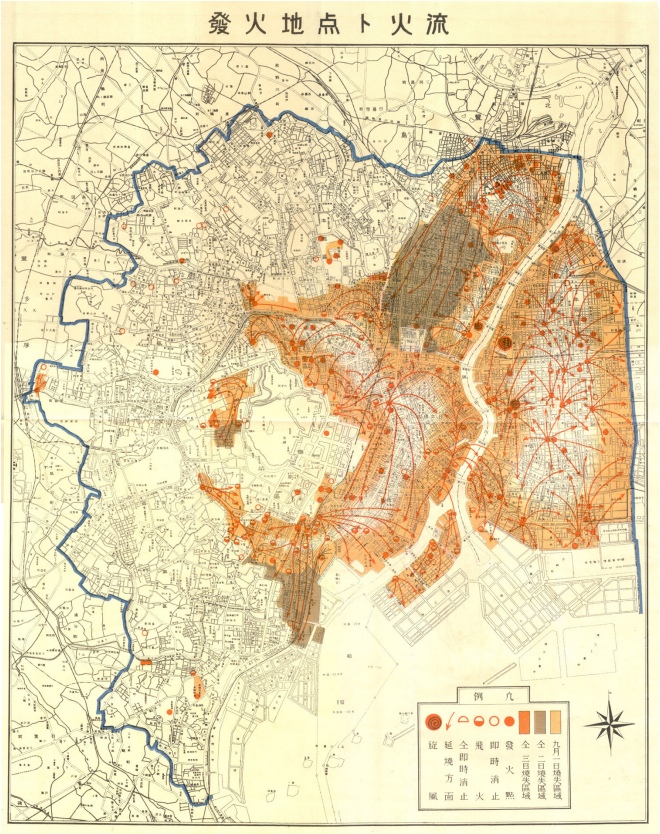
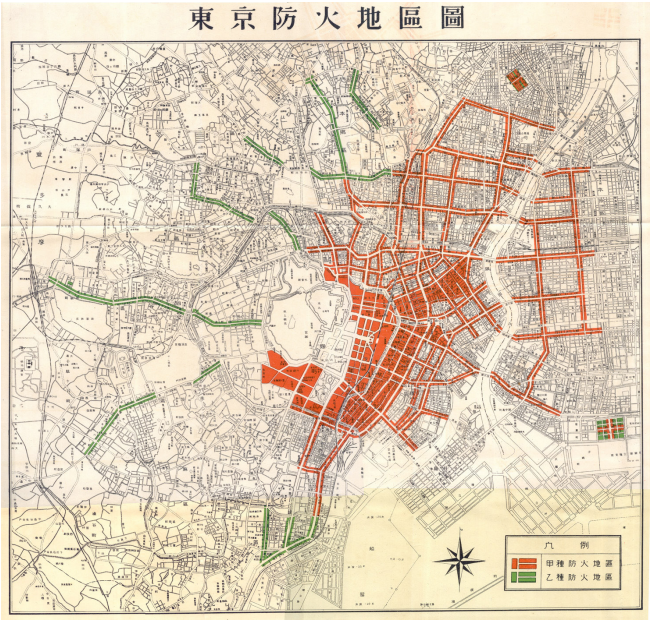


図４・７　超過収用による直線的大通りの建設（オペラ通り）
出所：レオナルド・ベネーヴォロ著　佐野敬彦・林寛治訳(1983)『図説・都市の世界史４』60頁


發火地点ト火流
凡例
九月一日焼失区域
全一日焼失区域
全三日焼失区域
発火点
即時消止
後全即時消止
延焼面
延焼方向


東京防火地區圖
凡例
甲種防火地區
乙種防火地區

broader street networks.[60]

fig. 5.10 (opposite)
"Location of where fires and fire storms ignited and the direction of their growth"
Author unknown. Source: great-kantoearthquake.com

Map illustrating fire spread in the aftermath of Great Kanto Earthquake. As it spread, that fire would facilitate and propogate new urban models.

fig. 5.11
"City of Tokyo fire prevention district plans"
Author unknown. Source: great-kantoearthquake.com

Map illustrating fire-prevention districts proposed in the aftermath of the Great Kanto Earthquake. This scheme, similar in nature to *Imperial Capital Reconstruction Plan for Tokyo City*, shows the mercantile centre to the east of the Castle, including Ginza, rebuilt in fireproof building materials. New arterial roads to the north and east are proposed, facilitated by 'Land Readjustment' practices, inspired by Haussmann. These are to be wide, and lined with fire-proof buildings. Author unknown.

And if the *Imperial Capital Reconstruction Plan* re-articulated the logic of medieval fire-safety, it also reinforced the spatial infrastructure of old Edo; the garden residences of the former *daimyo* that had been seized by Meiji governmental offices, were now re-conceived as a fire-protecting green-belt flanking the west of the city. To the east, where the dense working-class housing and the chief fire-risk remained, the plan suggested a further widening of key streets, re-trenching the spectral castle-wards. Requirements for fire-proof construction were limited to a specific areas of subsidized construction. These were within the district of Ginza, the mercantile quarter, which now formed a fire-safety blockade between the Castle and working-class residential district. Re-enacting Nobutsana's plan, the city officials re-drew the cadastral map of 33 million square metres of the city, reducing individual plot sizes and increasing orthogonality of the street layout, in order to create the expanded infrastructure of fire-prevention (fig. 5.10-11). And this ad-hoc approach was to prove nationally influential, lending its name to the prominent urban design journal of the time; it is during this period that 'Land Readjustment' came be to be recognized as the 'mother of urban planning' in Japan. [61]

Modernology and the Barrakku

But again, like those of Nobutsana, these plans were never fully realized, meeting resistance on the ground from local land-owners, and lacking in capital funds to make compulsory purchase. The limits of Post-Kanto re-constructions are perhaps most evident in relation to the question of emergency housing. In 1924, in the context of acute and extensive homelessness, the Japanese Government drew up plans for its first social-housing enterprise, the *Dōjunkai*, or 'mutual benefit society'. This organization proposed the first concrete multi-family housing projects in Tokyo, which would provide fire-safe accommodation for refugees from the earthquake.[62] But these housing projects – again received as politically and architecturally 'western' – were met with hostility, considered unsuitable for Japanese family life, and the scale of the intervention was dwarfed by the need. The majority of emergency housing needs were satisfied, not by the state, but through self-built '*Barakku*'. The destitute and homeless survivors of the earthquake picked up the remains of their broken homes, carried them to the edge of the city, and rebuilt them. Taking advantage of the mobile character of their building components, and by loose legal ties to land ownership, the urban poor built informal settlements of temporary 'barracks' around the perimeter of the city.

Records of these *Barakku* remain, surveyed by the architect and educator Kon Wajiro. [63] Wajiro is famous for the coining the term 'Modernology', which he used to describe the forms of social and urban change that Tokyo was undergoing during this period.[64] Of-


第九地區整理前現形圖


第九地區標準地位置決定圖

fig. 5.12-13
"Land readjustment used to create the intersecting Showa dōri and Yasukuni dōri Streets in 1927 left the surrounding areas largely untouched, creating numerous irregular and tiny sites"
Yorifusa Ishida, *Nihon kindai toshikeikaku no hyakunen* Tokyo: Jichitai Kenkyusha, 1987), 165. Reproduced in Hein, Carola. "Shaping Tokyo: Land Development and Planning Practice in the Early Modern Japanese Metropolis." *Journal of Urban History* 36, no. 4 (July 1, 2010): 459

fering a kind of mythic opposite to Shinpei Goto, Wajiro recognized that the earthquake had provided both stimulus and opportunity for the transformation of Edo into a westernized, technocratic capital. He celebrated the *barakku*, then, as a form of political resistance. Far from simply satisfying the existential needs of survival, he suggested we read these buildings as an attempt to recreate familiar aspects of everyday life; in particular he noted the reconstruction of decorative features – traditions of embellishment dating back to feudal sumptuary law – that were shunned by modernist city planners and the architects of the Dōjunkai (fig. 5.14-15). Indeed, he formed his own 'Barrack Decoration Company' as a means to use this practice to launch a critique against modernist re-planning of the city.

Unburnable City

But the spectre of a European urbanism would take on a more urgent significance in the build-up to World War II. During the 1930's the Japanese Home Ministry prepared a number of educational films intended to prepare the population for the domestic risks of war. One of these films, *Moenai Toshi* (the Unburnable City), concerned the 'absolute inevitability' of aerial bombardment, habituating citizens to the fact that 'many Japanese cities, overnight, will be completely destroyed' (fig. 5.16-18). The purpose of these films – like the incentives of the Shogun - was again to compel individuals to fire-proof their homes, this time on the basis of national solidarity. These promotional films – alongside associated leaflets and posters - drew on memories and images of the Kanto earthquake to conjure an image of the Japanese city in ruins, contrasting these with aerial photography of the European city. Emblazoned over these images of broad streets and masonry buildings was the slogan "Air Defence is Fire defence!"[65]

But again, the effect of these campaigns was limited. As Kari Shepherdson-Scott suggests in her work on their reception, it was well known that despite their predominantly masonry construction, European cities remained vulnerable to incendiary bombing, and the drive did little to cement fire-proof construction as a norm. She suggests that the films effect was limited to accelerating the preventative demolition of fire-breaks outlined in the reconstruction plan, to form clearing around key pieces of infrastructure, such as train stations. Needless to say, the intensity of the bombing experience – like Godzilla ripping through power cables – would overwhelm this defensive infrastructure, leaving the whole of Tokyo in ruins for a third time.

The Metabolism of Cheap Wooden Apartments

The way that post-war Japanese architects wrestled with European precedents, tailoring them to the Japanese context, is perhaps best known through the work of the Metabolist architects. In their 1960 group show, these architects and urban designers exhibited a range

of projects that would draw upon modernist paradigms – particularly the use of in-situ cast concrete, and the mega-structure form – tailoring them to specifically Japanese concerns. The resilient fixed infrastructures of Kurakawa's *Agricultural City* would lift itself above flood and tsunami, allowing for flexible infill accommodation (fig. 5.20). Likewise, his *Wall City* would propose a networks of elevated and inhabited highways, dividing up a city which remained otherwise low-rise and piecemeal in its arrangement (fig. 5.19).[66] And more famously, Kenzo Tange's *Tokyo Bay Plan* proposed abandoning land altogether, as an attempt to escape from imperialist ambition.[67] Common to these and many other schemes of the period, and resonating with previous plans for the reconstruction of Tokyo, would be a perceived need to provide fixed resilient, typically reinforced-concrete infrastructures, supporting and subdividing flexible and replaceable living accommodation; the castle-town diagram of medieval Tokyo taking Modernist architectural form.[68] But this ambition contrasted absolutely with the official plan adopted for Tokyo. Favouring a policy of national de-centralisation, the Tokyo Metropolitan Government completely failed to prepare for the massive population increase that would occur in the immediate post-war context, its reconstruction plans essentially re-iterating the Imperial Reconstruction Plan. Again, some 20,000 hectares of land were scheduled for re-adjustment, so as to facilitate infrastructure widening as preventative fire-breaks. But by 1983, when the post-war reconstruction plan was officially considered complete, only 1600 hectares of land had been re-planned.[69]

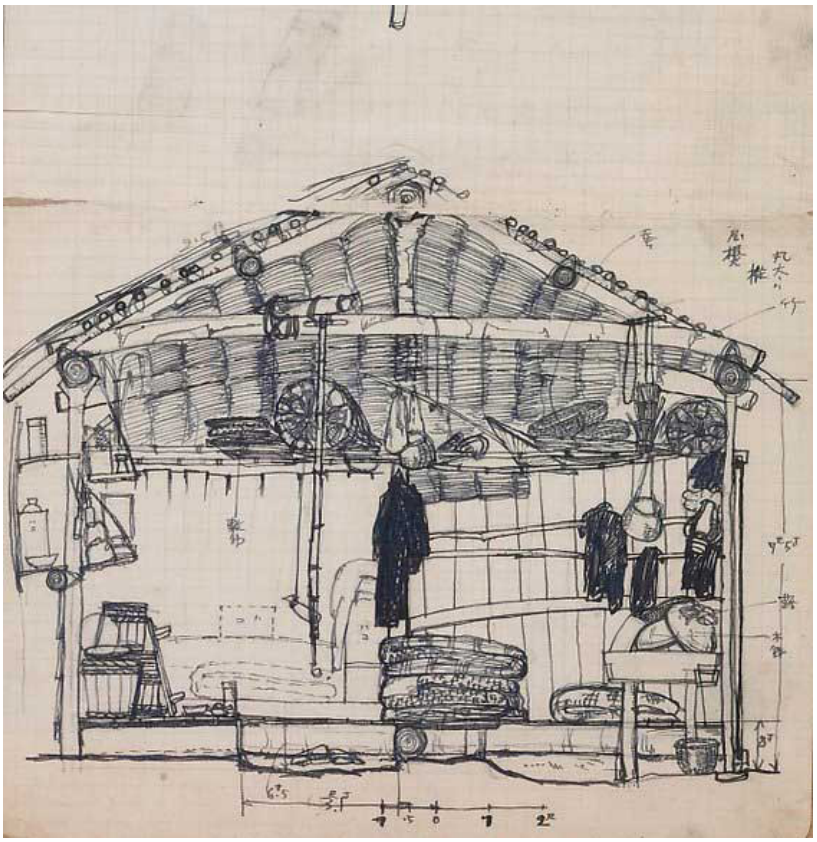
fig. 5.14, 5.15
"Household of a newly-married couple, Entrance and home office"
Wajiro Kon, *Modernologio*, 1925

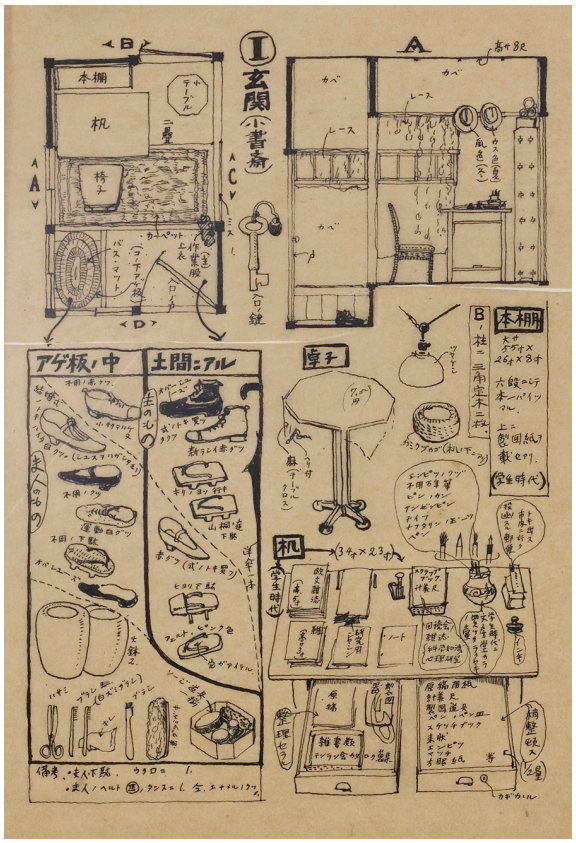
Drawing depicting urban living conditions in the aftermath of the Great Kanto Earthquake.

And while there were continued plans for reinforced concrete refugee housing projects, organized through a new Housing Management Foundation, due to the exigency of demand, most were completed in timber. That is, through the combination of a number of factors, post-war reconstruction in Tokyo failed to eradicate dense cheaply built timber buildings, indeed it increased their concentration. Government sponsored timber refugee housing jostled for space at the perimeter of the city, overwriting the informal *Barakku*. And as Tokyo's population increased - doubling between 1945 and 50 alone – the majority of this population found itself accommodated in cheap timber tenement buildings constructed by the private sector. This confluence of self-built, state-subsidised and private sector construction created what came to be known as the 'Cheap Wooden Apartment Belt', a halo of high-density low-rise timber housing that surrounds Tokyo's city centre, marking the extent of its historic fires.[70]

Escape from Tokyo

As the Japanese asset price bubble started to peak, fears about urban fire-risk became a significant issue. The then governor of Mukojima ward – a poor district situated in the Cheap Wooden Apartment belt – would use this concern to launch on Mayoral bid for Tokyo.[71] His platform was to improve the city's fire resilience, and his means to do that was a single project, the Shirahige-Higashi complex. This building would return the question of fire-safety to




玄関(小書斎)
本棚
机
椅子
テーブル
本棚
机
椅子
A
B
C
D
土間ニアル
アゲ板ノ中
卓子
本棚
机


燃えない都市


日本の諸都市は


灰燼と化さん

fig. 5.16 - 5.18
The Unburnable City
Illustration Credit: Original film source, *Moenai Toshi*, Tōhō Film Studio and the Home Ministry, 1938. Reproduced in Shepherdson-Scott, Kari. 'Toward an "Unburnable City" Reimagining the Urban Landscape in 1930s Japanese Media'. 2016.

Film stills from *Moenai Toshi.* Opening scene depicting European masonry urbanism against the title "The Unburnable City" (top); scene depicting contemporary Japanese city scene against title "Many Japanese cities" (middle); scene depicting demolished and smouldering city against title "will be completely destroyed" (bottom).

a Japanese idiom, explicitly invoking the Chiyoda castle as its urban and architectural precedent. In its initial plans, the scheme is conceived as a series of defensive ramparts surrounding a protected bailey, with staggered and overlapping entrance sequences reminiscent of the traditional Japanese 'maru', or citadel, typology.[72] As constructed, its 18 interconnected apartment blocks, each 15 stories high, form an urban fire-wall that running along the banks of the Sumida river. The elevation of the city-side of this building, which looms over a district of 2-3 story timber buildings, is equipped with steel shutters that, in the event of fire, create an unbroken fire-wall over a kilometre in length (fig. 5.21, 5.22). Beneath the building, underground trenches connect it to the cities fire-fighting command centre. And along the river-side of the building, lined with open access galleries, are fire-cannons. The orientation of these canon's is telling: the purpose of the scheme is not to defend Mukojima, or even the inhabitants of the complex. The fire canons are intended to dowse a strip of land that runs along the edge of the river. That is, the scenario that this building anticipates is of an uncontrollable urban fire-storm, during which its purpose is to maintain a means of evacuation for the entire population of the city, as they run for their lives. Shirahige-higashi is considered a success in the fire-safety community – an example of the forms of urban and architectural resilience the city needs – but it was a political failure; coming to be seen as an extravagance the city could not afford.[73] 30 years on it still sits in the midst of 2-3 storey timber buildings, despite the fact that this district has been entirely demolished and rebuilt during this period.

Intentional Ignorance, Spontaneous Nationalism

Since we began this section looking for historical learning, we might be concerned that all Tokyo's planners learn from their past mistakes is how to repeat them identically.[74] Likewise, if we had hoped that fire would broker an enlightened 'cosmopolitanism', a respect for the Other, if anything we seem to see the reverse. Neither of these would be novel conclusions; indeed, what is common to most of the historical accounts I have drawn upon here is a sense that fire-safety reform in Tokyo has failed successively because while grand urban visions have been proposed, these have been rejected as 'western'. Carola Hein considers this point in detail, noting how in both Post-Kanto and World War II reconstructions, Tokyo's planners consistently rejected comprehensive urban plans, empowered and supported by detailed regulatory frameworks, in favour of loose zoning codes.[75] She recounts the politics of these ambitions, showing how such unitary plans were repeatedly resisted by both finance departments, and the land-owning lobby.[76] The limited successes of Tokyo's disaster resilience planning might therefore be explained as part of a more general failure of western-style planning to take root in Japan, resisted by a culture in which individual land-ownership has come late, and where government policy has been steered by a small, powerful and well-organised land-ownership lobby. This urban and regulatory analysis would find its fire-safety corollary in literatures considered above - such a Frosts *Coping in Their Own*

Way - which identify a particularly Asiatic 'fire-regime', one which seems to accept regular loss of property, explaining this through the different historical significance of fixed capital assets in those cultures.

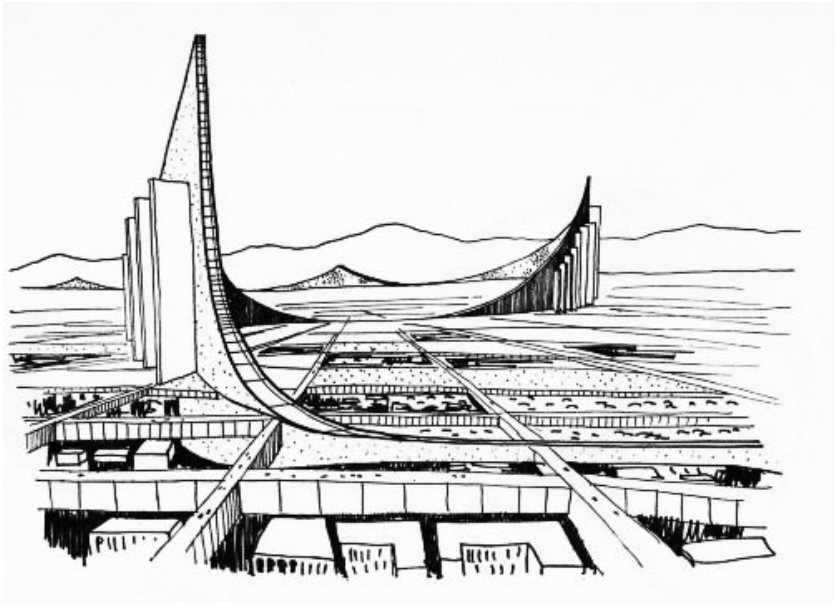
I have drawn on these scholars in order to show how – through the Meiji restoration and the opening of Japan to international trade, or through the Kanto Earthquake and conscious ambitions to westernize Tokyo's planning, through war-time air-defence measures, or through the work of Metabolist group, problems of urban fire-safety do appear to have come to be thought of in terms of a cultural opposition between East and West. But my purpose in recounting this narrative is not to reinforce it; indeed, I am concerned that, in the very act of using such a culturally oppositional logic to explain this state of affairs, we reflexively harden that way of thinking. Rather, I began this chapter with an analysis of the fire regime of Edo – a city which was relatively isolated from the West, or indeed other international influences - in order to suggest that, despite all the changes in the intervening period, the technologies of fire-safety in Edo-Tokyo have remained remarkably consistent. From Nobutsana and Yoshimune to the Meiji Administration and Shinpei Goto, the Home Ministry, Kenzo Tange and Kisho Kurakawa, The Housing Management Foundation and the governor of Mukojima; all have offered a visions of a spectral castle, of a city carved into wards by widened streets and regulated, fire-resilient buildings, while in practice, Tokyo has continued to become an ever denser 'village'. What I wish to suggest in the concluding section of this chapter is that, below this level of cultural interpretation, Tokyo's fire-safety regime continues to fail due to a kind of reflexive self-limitation, similar to that identified within Yoshimune's govern-mentality. In doing so, I will try to suggest a different kind of enlightenment that fire is brokering in Tokyo today, through a forced relationship within a different kind of 'other'.

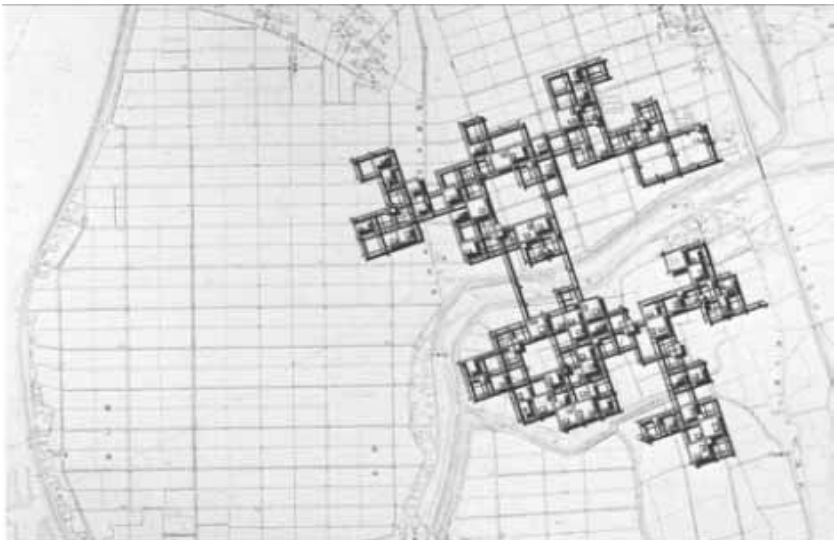
fig. 5.19-20
Kisho Kurukawa's Resilient Infrastructures
Kurokawa, Kisho. *Metabolism in Architecture*. 1977.

Wall City, 1959 (above), proposes a network of raised arterial road, subdividing the existing city. It bears a striking resemblance to previous plans for urban fire-safety in Tokyo, from the Tokagawa era onward; *Agricultural City,* 1960 (below) likewise proposes a system of fixed elevated transport infrastructure, here to protect from flooding and tsunami, while allowing flexible accommodation between.

fig. 5.21-22 (overleaf)
Shirahige-Higashi Complex
Photo Credit: Liam Ross, 2017

The city-side façade of Shirahige-Higashi Complex looms over Mukojima, separating it from the Sumida river, and urban evacuation park beyond (above). Mukojima ward is typified by densely packed timber housing, forming part of the 'cheap wooden apartment belt' (below).





5.5
Petrified Mentalities

Spectre of Catastrophe.

Tokyo no longer burns down every six years. The severity and frequency of fire in the city has reduced, but not on account of the urban or architectural innovations discussed thus far; historical analysis shows that the introduction of piped-water infrastructures, and a professional fire-corps both led to radical reductions in loss of life and property.[77] If it is no longer part of the everyday pulse of the city, the spectre of *catastrophic* fire hangs over the city, nonetheless. Japan is a global centre for fire-science, and its state-of-the-art concerns the real-time computational modelling of urban fire-dynamics, used to coordinate fire-fighter activity. The scenario that this science studies is that of multiple, post-earthquake fires. Its findings are that, within dense timber fabric, such fires are un-fightable; the goal of fire-fighting policy in these situations is not to *extinguish* the fires, but to coordinate efforts so as to secure arterial routes, and maximize available time for urban egress.[78]

Fire in Tokyo is becoming virtual, then, becoming something that needs to be imagined, becoming 'risk'. But this does not stop it from also being hazardous. Earthquakes are relatively predictable; seismologists suggest a 70% chance of a factor 7 quake striking the Tokyo Metropolitan region within the next 4 years, increasing to 98% over the next 30 years. And while the infrastructures of fire-fighting have improved, the combustible mass of the city is growing all the time. A 'big-one' in Japan is likely to kill tens, or hundreds of thousands of people, and lead to property damage worth hundreds of trillions of yen, with fire playing a major role in both losses.[79] It is for these reasons that the global re-insurance Agency Swiss RE rates Tokyo the world's most risky city within which to invest in property.[80] And the mapping that supports their analysis shows how risk patterns in the contemporary city; along the major circulation axis, pyro-seismic hazards are considered well-managed, through the use of reinforced concrete construction.[81] Fire risk concentrates in the dense interior of the 'superblocks', and the peri-urban sprawl of the

Cheap Wooden Apartment Belt.

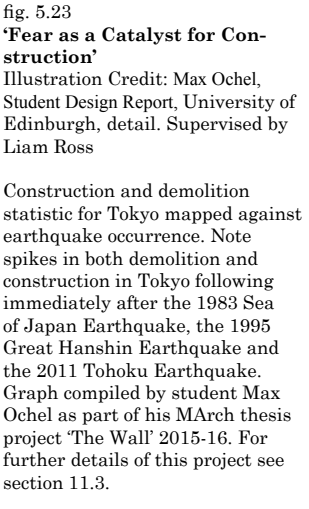


fig. 5.23
'Fear as a Catalyst for Construction'
Illustration Credit: Max Ochel, Student Design Report, University of Edinburgh, detail. Supervised by Liam Ross

Construction and demolition statistic for Tokyo mapped against earthquake occurrence. Note spikes in both demolition and construction in Tokyo following immediately after the 1983 Sea of Japan Earthquake, the 1995 Great Hanshin Earthquake and the 2011 Tohoku Earthquake. Graph compiled by student Max Ochel as part of his MArch thesis project 'The Wall' 2015-16. For further details of this project see section 11.3.

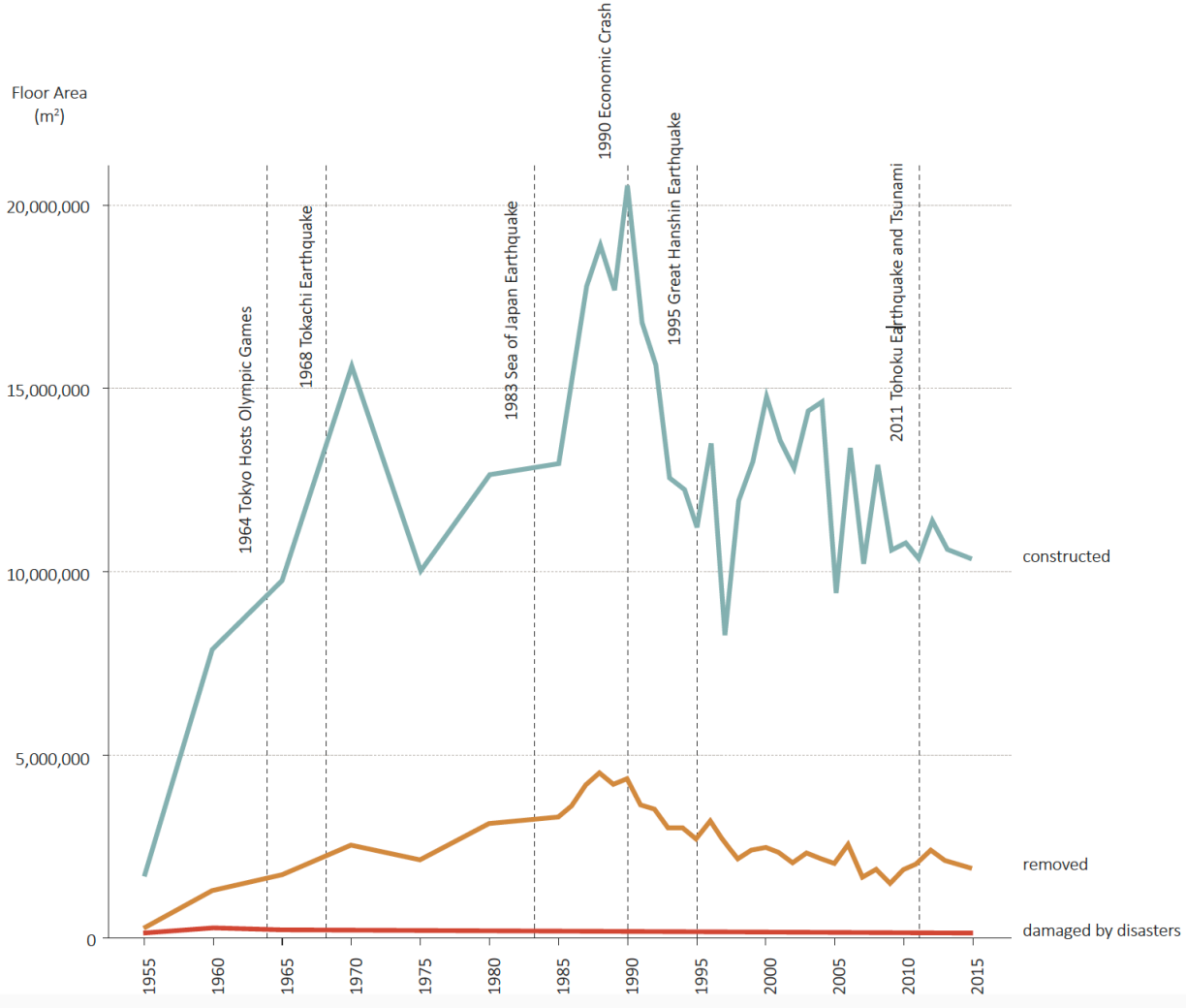
Programmatic 'As If'

But despite the fact that there have been no major urban conflagrations since WWII, Tokyo continues to behave *as if* it were constantly being destroyed. The city is in its 'third generation' of development since the Great Tokyo Air Raid; on average, every plot has been demolished and rebuilt three times during this period. Since 1957, a total of 1 million m^2 of Tokyo real-estate has been destroyed by fire and earthquake, while 87 million have been intentionally demolished, and almost 500 million constructed. And though the rapid rate of reconstruction in the city is no longer a direct material consequence of fire, it is nonetheless shaped by fire *risk* fire.

As we have already noted, the Japanese Land Ministry suggests that developers anticipate their buildings being demolished within 30 years.[82] At one level, this statement is simply a statistical fact; however, the ministry also provides two reasons as to why this trend is, in fact, beneficial. The first is to facilitate improvements in seismic and fire-resistant construction. That is, fire offers both the need and the opportunity to ensure that the city remains state-of-the-art. In contrast to the European context, then, there is little market for second-hand buildings in Tokyo, which are often considered unsafe.[83] And this consumer preference is formalized through standardization; the three generations of post-war development in Tokyo can be defined broadly through policy changes regarding urban fire-prevention (in 1943, 1973 and 1996), with each new code rendering the existing fabric as non-compliant.[84] Further evidence supporting the sense that Tokyo rebuilds itself on account of a *fear* of fire is offered by charting the rate of construction against time. Spikes in demolition and reconstruction occur within the city, like echoes and reverberations of real catastrophes elsewhere; when earthquake and fire strikes in Kobe, Tokyo demolishes itself (fig. 5.23).

Vicious Circle

We have already seen that this first logic is fictive; by-and-large, Tokyo rebuilds itself from the same quick, cheap flammable fabric it always has. This is explained, in part, through the second reason offered by the Land Ministry; rapid reconstruction is seen to facilitates land-use flexibility. That is, the anticipation of fire, offers two accidental governmental benefits supporting the construction industry, at the same time as creating an urban flexibility, through which the city can be re-zoned for different programmes, as commercial needs dictate.[85] This flexibility is important for another governmental reasons, that of taxation. Inheritance tax is very high in Japan, and it has led to a phenomena known as the *subdivurban*


Floor Area
(m²)
20,000,000
15,000,000
10,000,000
5,000,000
0
1964 Tokyo Hosts Olympic Games
1968 Tokachi Earthquake
1983 Sea of Japan Earthquake
1990 Economic Crash
1995 Great Hanshin Earthquake
2011 Tohoku Earthquake and Tsunami
constructed
removed
damaged by disasters
1955
1960
1965
1970
1975
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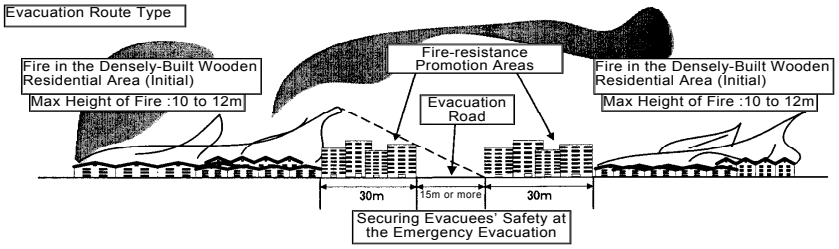
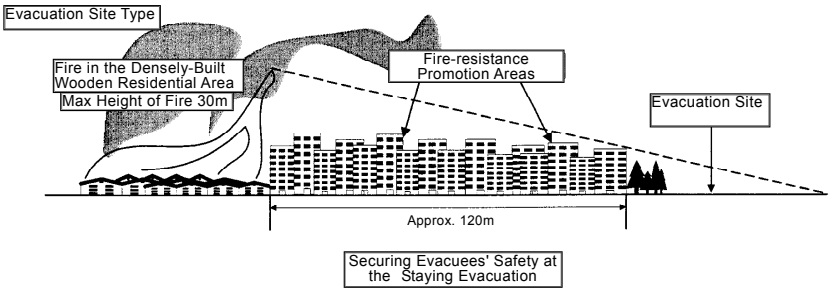
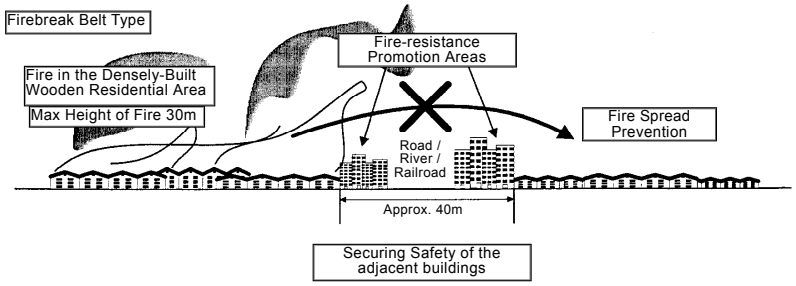
1995
2000
2005
2010
2015



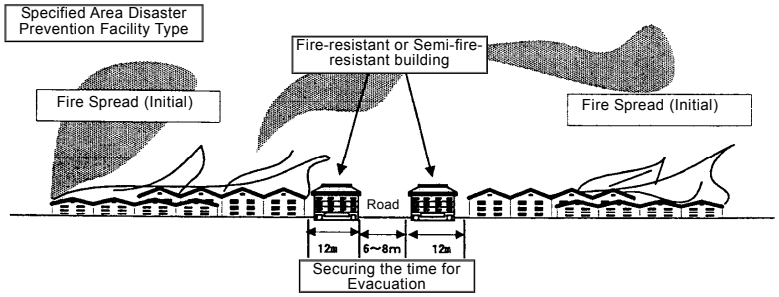
○ To protect the evacuees from the radiant heat of neighboring massive fire by making the area fire-resistant within approx. 30m from the evacuation roads designated in the Community Disaster Prevention Plan.



○ To protect the evacuees staying in the Refuge Site from the radiant heat of neighboring massive fire by making the area fire-resistant within approx. 120m from the Refuge Sites designated in the Community Disaster Prevention Plan.



○ To prevent the fire spread to the adjacent blocks and secure the safety against urban area massive fire by making the area fire-resistant within approx. 45m combined with the width of the principle roads which are the framework of the Firebreak Belts designated in the Regional Disaster Prevention Plan.



○To prevent fire spread in a few hours against initial fire and secure the evacuation time, by making the area fire-resistant within approx. 12m (a space of one unit) surrounding the Specified Area Disaster Prevention Facility under the Act on Promotion of Improvement of Disaster Control Districts in Populated Urban Districts.

fig. 5.24
Fire Resistance Promotion Areas
Extract from *Outline of Urban Planning*, Section 5, "Urban Disaster Resilience", pp 119-120. Bureau of Urban Development, Tokyo Metropolitan Government.

Illustration describing extent of Fire Resistance Promotion areas around evacuation routes, sites, fire-break belts, and disaster prevention facilities. Note that no degree of fire-resistance is required within "densely built wooden residential districts", and that the scale of required fire-resistance promotion zone relates to time of evacuation required from those districts; these regulatory mechanism are not anticipated either to stop the outbreak of massive urban fires, nor to prevent those fires from ultimately overcoming the whole of the urban fabric, but only to delay this presumed inevitability.

(subdivided urbanism).[86] Within this shrinking population, inherited property is typically demolished, such that a percentage of the land can be sold off, so realizing the tax quotient. Indeed, inheritance tax is perhaps the most powerful regulatory lever for stimulating or limiting property speculation; it reached a peak of 70% during the asset-price bubble, and now stands at 40%. What it necessitates is a continuous increase in development density to realize this generational yield; average plot-sizes have reduced factorially since WWII, from 240m2 to around 80m2.[87] And at the same time, this practice has cemented a devaluation of buildings themselves, which must be demolished so as to liquidate and release the potentially limitless inflation in land-value. That is, on the one hand, it is possible - during the height of the asset-bubble - for the land on which Chiyoda Castle sits to be valued more highly than all of the real-estate in the state of California. But at the same time, the aggregate value of all buildings in Tokyo is nothing. Buildings within the city tend to become worthless after around 15 years, about half their lifespan, when their potential rental return dwindles in relation to forecast demolition cost, turning what was an asset into a liability.[88]

That is, the two logics provided by the Land Ministry interact to create a vicious circle, one that reproduces the 'prisoners dilemma' of feudal Edo. Individual Tokyoites cannot afford to invest in fire-resistant technologies, because they cannot afford to lose them. The difference today is that that loss is no longer even a risk; it is effectively guaranteed. Tokyo's individual property developers keep building in cheap, flammable building materials to safeguard themselves against trans-generational debt-liability, a risk which is today more 'real' than that of fire. But in so doing, they reproduce the circumstances of their precarity. That is, after Beck, we could identify a kind of reflexive irony within the 'risk' of fire. Tokyo's urban legislative frameworks undermine their own stated aims; reinforcing the cultures of rapid reconstruction which provide their ontological base, the city *makes itself fear*. What is not at stake here is whether this circumstance has been consciously designed, although the fact that programmes of building standardization have been consistently resisted by both land-owners and the finance ministry, suggests that it is well understood. Rather, my point is to suggest that the 'non-subjective intentionality' of Tokyo's urban legislative frameworks is *sustain* the risk of catastrophic fire, not to negate it.

Piecemeal Castle

The current legislation for fire-safe construction in the city is defined by the *Fire Resistance Promotion Areas* included in the Tokyo Metropolitan Government's Urban Planning guidance.[89] This document defines its famous 'Hard-Shell, Soft-Yolk' morphology, incentivizing fire and seismic resilient construction through relaxations to building height limits along major arterial roads. That is, this document again seeks to carve the city up into fire-protection wards, defined by wide clearings and reinforced concrete buildings. Indeed, through this ordinance, the shape of the city becomes a direct index of future

catastrophe; the heights and depths of its buildings, and the width of its roads, are defined in relation to the anticipated height of fire within neighbouring wards (fig. 5.24). Beyond the Hard Shell, the next layer of streets are dedicated to emergency vehicle access, and are lined with 'semi-fire-protected' buildings, of a lower height. In the Soft-Yolk, buildings heights are limited further still, but there are no restrictions on the use of flammable materials. This gradient of fire-protection also implies a gradient of locality; the major arteries are called 'Global' roads, and the interior roads 'Local', while the fire-service access streets are given the Jinglish portmanteau 'Glocal'.[90] That is, the question of fire-safety is still associated with one of internationalisation, with the regulated facades of broad streets identified as 'western' in character, and the dense, impermanent, imperfect interior an expression of 'Japaneseness' or 'Wabi-Sabi'.[91]

fig. 5.25-26
The Space Between Buildings
Photo Credits: Tom Gally, Mina-to-ku, Tokyo, August 6, 2011

In contemporary Tokyo, the urban expression of landowner autonomy reduces to an inaccessible 700mm airspace.

In reality, however, this plan remains far from complete, It's realization again subject to a kind of reflexive limitation. The construction of today's defensive, fire-safe ramparts requires large-scale corporate clients in need of big buildings, who can identify large plots of land, and are willing to engage in real-estate speculation beyond the generational life-cycle of buildings. As such, this new 'castle' is not evenly distributed. Even within the commercial centre these defensive walls are incomplete, and so ineffective; plots redevelop according to the vagaries of the market, and the local context, leaving some empty, or others not built to the design height, or depth. And these commercial pressures fail to extend to the Cheap Wooden Apartment Belt at all, where the risks are greatest. That is, far from resembling the kind of coordinated authority embodied by Chiyoda Castle's ramparts, the Hard-Shells of contemporary Tokyo have more in common with Kafka's 'Great Wall of China'; their state of incompletion seems less a momentary condition, more an end in itself, a rhetorical gesture intended to announce the impossible scale of the task.[92]

Horizon of the Subdivurban

Meanwhile, in the village, plots have become so small, they can no longer be sub-divided. This low-rise hyper-density has spawned a kind of accidental architecture, described by Atelier Bow-Wow as 'pet-architecture'; extraordinarily miniature buildings – sushi-bars, micro-residences, shops and shacks - that squeeze into left over urban spaces.[93] And at the same time, it has brought an accidental dimension to urban design. In these "4th generation villages", plot coverage is approaching 100%.[94] The only remaining space within the city is the by-product of another law – this time a civil code – which requires a 700mm boundary be left around the perimeter of all buildings (fig. 5.25-26). This rule – intended to allow maintenance access and facilitate demolitions – is creating new patterns of urban infrastructure. As landlocked plots are created, these small gaps, Tokyo's famous 'space between buildings' become the only means of access (fig. 5.27). Nonetheless, they have been celebrated by photographers, film-makers, novelists and architects as quintes-

fig. 5.27
Tokyo Roji
Photo Credits: paxjapon (flickr)

'Roji' are informal alleyways, created in the gaps between buildings. They create an accidental and unregulated urban infrastructure.

sentially Japanese. Ryue Nishizawa, for instance, in his Moriyami house, intentionally subdivides a generous lot into 5 micro-dwelling in order shift the focus of design from the object of architecture, to the 'accidental' spaces created between buildings, and to enjoy the quasi-public, quasi-sociability of these alleys (5.28). And Koh Kitayama, in an explicit critique of the 'Haussmannian' character of 'Global' streets, would see in them a model for social 'resilience':

> Large Scale buildings erected with huge amounts of capital stand along arterial roads in Tokyo, part of an urban planning project to introduce a fire-belt to the area. As business efficiency is low in this crowded inner-city neighbourhood, there has been little in the way of large-capital development... [Here] the shop workers and residents are generally familiar with each other's faces. In this densely populated area of wooden houses, people exchange glances and have some idea about each other's lifestyles. This type of environment, imbued with a sense of community, helps to create a rich and fulfilling life.[95]

fig. 5.28
Moriyama House, Ryue Nishizawa (2005)
Photo Credits: Diversare.com

The Moriyama House seeks to recreate the accidental spatial and social character of Tokyo's 'Roji'.

The small lanes created by this civil law are known as Roji, and they present the city with a significant pyro-seismic risk. Not recognized as pieces of designed infrastructure, they are not subject to planning ordinance.[96] Punctuated internally by unprotected openings – windows and extract grilles – they provide a space for the spread of flame both between adjacent buildings, and between superblocks, and a major risk for urban egress. Likewise, they concentrate seismic movement within a small distance, creating the phenomena of seismic 'pounding', preventing buildings taking support from their neighbours. But if they are both a problem and an opportunity, both would seem to be passing. The village has reached its horizon of possibility, and subdivurbanism now has only one direction to go in.

Slowing Metabolism

That is, if we have considered the fire-regime constructed between durable, corporate slab-buildings and low-rise, disposable timber dwellings, one further Tokyo typology demands consideration, that of the high-rise residential tower. And its role is significant for the prospect of urban fire-safety. Tall buildings in Tokyo typically make use of reinforced concrete cores for both structural, as well as fire-safety purposes; the higher yields offered by high-rise buildings both necessitate and justify more resilient construction practices. That is, if the problems of fire, land-value and a timber building stock can seem to create a viscous circle, when the building material changes, that circle can also appear virtuous; when land reaches a certain value, the problem of fire-safety seems to solve itself, through the required use of concrete construction. Indeed, the experts I spoke to in Tokyo suggested that this view – that the fire-safety problems created by land-value escalation would likewise be solved by land-value escalation – has supported a tacitly *lais-*

sez-faire attitude by urban regulators since the 1980's.

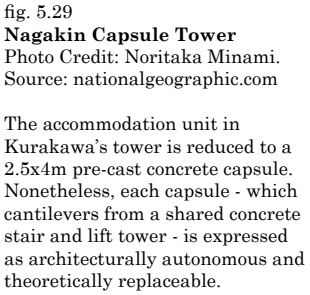


fig. 5.29
Nagakin Capsule Tower
Photo Credit: Noritaka Minami.
Source: nationalgeographic.com

The accommodation unit in Kurakawa's tower is reduced to a 2.5x4m pre-cast concrete capsule. Nonetheless, each capsule - which cantilevers from a shared concrete stair and lift tower - is expressed as architecturally autonomous and theoretically replaceable.

But this shift from mediating fire and property through timber, to concrete, is not a simple one. Indeed, what I wish to suggest, by way of a conclusion to this study, is that it changes the nature of the perceived problem. The change I have in mind is demonstrated by one of the most celebrated Metabolist buildings to have been constructed in Tokyo, Kisho Kurakawa's Nagakin Capsule Tower (fig. 5.29). This building responds to a design challenges we are now well briefed to understand; how to increase the density of the city, and improve its pyro-seismic resilience, while retaining patterns of individual ownership, and cultures of cyclical replacement? Kurakawa's project attempts to synthesise these concerns through a design that seems to synthesizes aspects of both the Chiyoda *Donjon* and Edo's *Yakiya*. This residential tower sits on a durable, concrete base, raised above the city. It is organized around a central column, this time of a robust, reinforced concrete structural and access core. Around this core, modular dwelling are organized, here made from modular, off-site manufactured, replaceable dwelling capsules. That is, in this project we see an attempt to bring the architectonics, and the metabolic rates, of the 'castle' and the 'village' into close relation; Kurakawa famously proclaimed that, while the capsules would be replaced every generation, its core would last for 200 years.[97]

So far, only one of these claims has been proven false. Like those it inspired elsewhere– as in the Lloyds Headquarters, a building we will consider in the next chapter – the capsules of this tower have never been replaced. The reasons for this are obvious; it would be inconceivable for an individual tenant to remove and replace a single unit; the economic manufacture and installation of which require mass-production and organized construction. What is not inconceivable, though, is that the core of this building might last another 155 years; built in 1972, it is already an unusually stable feature within this changeable urban landscape. And it is the logic behind the counter-intuitive permanence of this project that are of relevance here. The Capsule Tower has not survived because it is liked by its occupants, who voted to demolish it,[98] and despite a public campaign, [99] supported by the Japan Institute of Architects and Kurokawa himself, no action has yet been taken to actively conserve it. Rather, the building is in a state of limbo, with neither outright demolition, nor replacement of capsules seen as economically viable. That is, what the Nagakin tower reveals about the 'metabolism' of construction in Tokyo is, in fact, the way that reinforced concrete as a construction material slows this down, due to the increased cost of its demolition. Indeed, where timber buildings last on average only 27 years, reinforced concrete buildings in Tokyo today last an average of 37 years, despite being less common and relatively more recent.[100]

Governmental Skeuomorph

That is, what I hope to have argued through this study as a whole, but what I think is also evident within this single building, is that Tokyo does not rebuild itself as a result of a conscious aesthetic or cultural preference. While these practices achieve an aesthetic and religious significance through their ritualization – as in the Ise shrine complex – in Tokyo we see their base in material, economic, governmental concerns. That is, what I have been trying to argue here is not that cultures of rapid reconstruction are the *cause* of Tokyo's urban fire-safety problems, but rather that the two co-produce each-other. I have tried to avoid explaining this technical problem through explicitly 'cultural' terms, so as to avoid rendering networks and their actancy, and so the capacity for change.

I use Nagakin Tower as a means to draw this reflection to a close, because I think it demonstrates such a moment of change, and one which reveals the actancy of construction materials within the formation of this governmental network. As Adrian Forty has argued, for the Metabolist group, as for other Japanese architects, concrete was a means to retain and express a local expertise in carpentry, through the construction of exquisite formwork.[101] As such, the trace of a former tradition becomes inscribed into a new one. What I want to suggest, via the Nagakin Tower, is an analogous process of translation, occurring now at the level of political-economy. In the failed replace-ability of these Capsule we see a govern-mentality of timber turned to stone, become *petrified*. In its ambition to sustain cultures of reconstruction, at the same time as undermining their ontological base, it offers us a kind of governmental 'skeuomorph', and aetheticisation that represents and replaces a particular political economy.[102] That is, the Nagakin Tower inverts the problems we have been considering throughout this chapter, seeming to ask: how can Tokyo sustain an economy of continuous consumption, and of the limitless escalation of land-value, when those factors conspire to create an accidentally durable urban fabric?

What I have sought to demonstrate throughout this chapter is the way that building design in Edo-Tokyo, through the problem of fire-safety, has become a means to construct particular political-economic relations. And what I wanted to demonstrate through this final example is that a change in the material properties of building, and so their susceptibility to fire, likewise implies a change in political-economy. As Tokyo builds higher, it will need to learn how cope with a more durable urban environment, in which buildings come to be seen as articles of fixed capital, as opposed to mobile commodities. This will have effects as to who is able to accumulate capital, but also on the role of building as an economic stimulus. How Tokyo manages that change is yet to be seen. I have tried to offer a brief history of the forms of resistance that this transformation has been subject to, indeed, what i mean to have suggested is that fire, and the replaceability of the building stock, might well be thought of as the 'spirit' of Tokyo, its particular 'genius'; it has certainly shaped the cities peculiar urban and architectural cultures, and helped sustain its position as the nations 'consumption' city. It is easy to see

how and why a wide range of interested stakeholders might wish to sustain this spirit, keep it alive. But what I have tried to suggest here are a series of reasons as to why Tokyo might seek to exorcise that spirit, in the name of public safety, the national economy, and sustainability. From my own, 'western' perspective the means to do that appear quite obvious: Tokyo needs to re-construct its regulatory frameworks, so as to undermine the legal autonomy of its land-owner class, more effectively inscribing a responsibility to the city within individual buildings, for instance by imposing requirements for non-combustible construction, limiting surface spread of flame, and unprotected openings. The urban and architectural consequence of those change would be to undermine the *spatial* autonomy of architecture in Tokyo's; to insist that the semantic units of buildings join themselves together into larger, more resilient urban configurations. This is, of course, the argument which many western commentators have made in the past, and which many Japanese urbanists have tried to promote, unsuccessfully. What I have sought to show here, though, is the way that this same result appears to happening anyway, as if by accident.

Note on Folio 11

The above analysis was supported in its development through two by-design analyses. These are presented in the appendix in Section Folio 11, alongside a further project which extends the analytic methodology speculatively. Folio 11.1 presents a series of analytic diagrams that map relationships between historic fires, contemporary fire-risk and fire-safety construction promotion policies in Tokyo, produced in collaboration with a Master's student, Max Ochel. The extents of destruction following the Meirecki, Kanto, and Tokyo Air Raid fires are shown, and shown to explain patterns of contemporary fire-risk. Folio 11.2 traces the origin of Tokyo's hard-shell, soft-yolk morphology through key urban and architectural paradigms. Furthermore, the deficits of the Hard-shell, Soft-yolk pattern are illustrated by a survey of Ojima, however, where the incompletion of firebreak walls is evident, their continuity compromised by small plots sizes and gaps between buildings. Folio 11.3 provides a summary of the Master's thesis project, supervised by the author, completed by Max Ochel and Alastair Hume. In this project, architectural speculation is used to explore the urban consequences of a set of interrelated factors; urban fire-safety legislation, practices of 'subdivurbanism', and the life-cycle costing of construction processes. Their project identifies the urban pattern implicit within Tokyo's fire-safety ordinance, using it to develop patterns of enhanced urban legibility within the city.

Included within this folio is a summary transcript of an interview conducted with Professors Ai Sekizawa & Yukio Nushida, of the Tokyo Graduate School of Global Fire Science and Technology, Tokyo University, which has informed the finding of this chapter.

(Endnotes)

1 The *Musashi Abumi*, Asai Ryōi, 1612-1691, quoted in Peter Kornicki, 'Narrative of a Catastrophe: Musashi Abumi and the Meireki Fire', *Japan Forum* 21, no. 3 (24 May 2010). p. 351

2 In this paragraph I draw particularly on Kornicki's account of the book, which focuses particularly on this topic.

3 Takashima Beiho, quoted in J. Charles Schenking, *The Great Kanto Earthquake and the Chimera of National Reconstruction in Japan* (Columbia University Press, 2013). p. 13.

4 In this paragraph I draw on the historical account of this event provided by Schenking.

5 The verbal testimony of Saotome Katsumoto, recorded in Richard Sams, 'Saotome Katsumoto and the Firebombing of Tokyo: Introducing The Great Tokyo Air Raid', *The Asia-Pacific Journal* 13, no. 10 (2015): pp 1-30.

6 In this paragraph I draw on the historical account of this event provided by Sams.

7 This phrase, and statistics on the frequency of fires in Edo, are introduced in Matsukata Fuyuko, 'Fires and Recoveries Witnessed by the Dutch in Edo and Nagasaki: The Great Fire of Meireki in 1657 and the Great Fire of Kanbun in 1663', *Itinerario* 37, no. 03 (December 2013): p. 172.

8 See Lionel Frost, 'Coping in Their Own Way: Asian Cities and the Problem of Fires', *Urban History* 24, no. 01 (May 1997): 5–16.

9 Innumerable popular accounts of the rapid replacement of Japan's building stock seek to ground this phenomenon within Japanese spiritual practices, particularly the Ise Shrine replacement practices. The following article in the *Economist* is indicative: 'Why Japanese Houses Have Such Limited Lifespans - Nobody's Home', accessed 20 August 2018, https://www.economist.com/finance-and-economics/2018/03/15/why-japanese-houses-have-such-limited-lifespans. Within academic literatures on property and fire, Jordan Sand cites the work of Lafcadio Hearn and Lionel Frost as supporting this same cultural explanation, one he finds ahistorical. See Jordan Sand, 'Property in Two Fire Regimes: From Edo to Tokyo', in *Investing in the Early Modern Built Environment*, 2012, p. 36. This same explanation can be found in Japanese literatures; as Schenking reports, Takashima Beiho, quoted above, was a prominent Buddhist thinker who contributed to the interpretation of the earthquake as divine punishment, and that reconstruction was an opportunity to demonstrate Japan's strength on an international stage. See Schenking, *The Great Kanto Earthquake and the Chimera of National Reconstruction in Japan*. p. 121-122

10 This is the topic of another of Schenking's publications on Tokyo's reconstruction. See J. Charles Schencking, 'The Great Kanto Earthquake and the Culture of Catastrophe and Reconstruction in 1920s Japan', *Journal of Japanese Studies* 34, no. 2 (2008): 295–331.

11 Published as the first issue of the magazine *Die Revolution*, New York, 1852, this contains Marx's most quoted passage: "Men make their own history, but they do not make it just as they please; they do not make it under circumstance chosen by themselves, but under circumstances directly encountered, given and transmitted by the past. The traditions of all dead generations weighs like a nightmare on the brain of the living… in creating something that has never yet existed they anxiously conjur up the spirits of the past to their service and borrow from them the names, battle-cries and costumes in order to present this new scene of world-history in this time-honoured disguise and this borrowed language." See Karl Marx, *The Eighteenth Brumaire of Louis Bonaparte* (Chicago Charles H. Kerr, 1907), http://archive.org/details/theeighteenthbru00marxuoft.

12 As Mark Dorrian pointed out to me, Marx's 'farce' bears a close relationship to Benjamin's 'Angel of History', presented in the *Theses on the Philosophy of History*. There Benjamin speaks of: "A Klee painting named Angelus Novus shows an angel looking as though he is about to move away from something he is fixedly contemplating. His eyes are staring, his mouth is open, his wings are spread. This is how one pictures the angel of history. His face is turned toward the past. Where we perceive a chain of events, he sees one single catastrophe which keeps piling wreckage upon wreckage and hurls it in front of his feet. The angel would like to stay, awaken the dead, and make whole what has been smashed. But a storm is blowing from Paradise; it has got caught in his wings with such violence that the angel can no longer close them. The storm irresistibly propels him into the future to which his back is turned, while the pile of debris before him grows skyward. This storm is what we call progress". The following account is informed by that image, which resonates likewise with the Beck's account of the 'Risk Society', characterised by horror, by a transfixed gaze, by backward-looking, and the counterproductivity of the means of historical development. See the Theses on the Philosophy of History Walter Benjamin, *Illuminations* (Houghton Mifflin Harcourt, 1968).

13 Ulrich Beck, *Risk Society: Towards a New Modernity* (London: SAGE, 1992).

14 In this section I am drawing on the historical account of Edo Castle offered by Schmorleitz in Morton S. Schmorleitz, *Castles in Japan* (Rutland, Vt: CETuttle Co, 1974). pp 99-113.

15 Morton S. Schmorleitz. P. 30

16 Morton S. Schmorleitz.p. 30

17 Richard L. Wilson, ed., *The Archaeology of Edo, Premodern Tokyo* (International Christian University, 1997). p. 15

18 My thanks to four students, Euan Miller, Damien Theron, Yannick Scott and Rachel Smilie, for drawing my attention to the relationship between decorative orders and seismic performance at the Edo Donjon.

19 Greg Bankoff, Uwe Lübken, and Jordan Sand, *Flammable Cities: Urban Conflagration and the Making of the Modern World* (University of Wisconsin Pres, 2012).

20 Here I continue to draw on Sand and Wills account. Where these authors use the phrase 'castle-town' to describe the Tokagawa Shogunate's approach to fire per-se, I here seek to use the Meireki fire as a hinge point through which the castle changes from a physical thing, to a strategy that is sublimated in frameworks of building regulation.

21 The impoverishing effect of sumptuary law, and the way the Bakafu used fire as an opportunity to impose new regulations, are recognised by Shivley in Donald H. Shively, 'Sumptuary Regulation and Status in Early Tokugawa Japan', *Harvard Journal of Asiatic Studies* 25 (1964): 123–64.

22 A detailed review of the way sumptuary law affected architectural style is offered in Laurell Cornell, 'House Architecture and Family Form: On the Origin of Vernacular Traditions Early Modern Japan', *Traditional Dwellings and Settlements Review* 8, no. 2 (1997): 21–31.

23 Wilson, *The Archaeology of Edo, Premodern Tokyo*. p. 14

24 Sand, 'Property in Two Fire Regimes'.

25 In an ironic turn the legality of informal settlements in these clearings turned on issues of fire, in more ways than one. Drawing on 18th C. legal testimonies, James McClain describes how the legal right of the Shogun to banish a landlord for renting a house to tenants in a fire-break turned on the question of whether the tenants – four Sumo wrestlers – kept a fire in the property. The presence of a fireplace was, in the period, what qualified a building as a 'normal residence'. Fire provided the material base through which laws of property and eviction were organized, and subverted, with a fire-place-less settlement being hard to remove from the fire-break. Sand.

26 Frost, 'Coping in Their Own Way'.p. 12

27 Sand, 'Property in Two Fire Regimes'. p. 57

28 Bankoff, Lübken, and Sand, *Flammable Cities*. p 59

29 Sand, 'Property in Two Fire Regimes'. p. 54

30 The status of buildings within a hierarchy of mobile property is reflected on in Sand. p. 47, 53

31 See Bankoff, Lübken, and Sand, *Flammable Cities*. p. 46. Also Carola Hein, 'Shaping Tokyo: Land Development and Planning Practice in the Early Modern Japanese Metropolis', *Journal of Urban History* 36, no. 4 (1 July 2010): p. 451.

32 Sand, 'Property in Two Fire Regimes'. p. 42

33 'Understanding the Lifespan of a Japanese Home or Apartment', 6 February 2014, http://japanpropertycentral.com/2014/02/understanding-the-lifespan-of-a-japanese-home-or-apartment/.

34 I borrow this term from Yoshiharu Tsukamoto of Atelier Bow-Wow. See 'Atelier Bow-Wow: Tokyo Anatomy', Archinect, accessed 17 August 2018, https://archinect.com/features/article/56468/atelier-bow-wow-tokyo-anatomy.

35 I presented this argument to two professors at the Tokyo Graduate School of Global fire, who by way of personal correspondence support this conclusion. Sekizawa Ai, Nishida Yukio, and Ross Liam, Fire Regimes of Edo-TokyoGraduate School of Global Fire Science and Technology Tokyo University of Science, 21 October 2016.

36 Ulrich Beck, Anthony Giddens, and Scott Lash, *Reflexive Moderniza-*

tion: Politics, Tradition and Aesthetics in the Modern Social Order (Cambridge: Polity Press, 1994).

37 Beck, *Risk Society*. p. 39

38 Beck. p. 11

39 'Moral Hazard - Insurance Glossary | IRMI.Com', accessed 4 February 2017, https://www.irmi.com/online/insurance-glossary/terms/m/moral-hazard.aspx.

40 Michel Foucault, *The Birth of Biopolitics: Lectures at the Collège de France, 1978-1979: Lectures at the College De France, 1978-1979*, trans. Mr Graham Burchell (New York: Palgrave Macmillan, 2010).François Ewald, *L'Etat providence* (Paris: B. Grasset, 1986).

41 Chapter 6 reflect on such a reflexive process; in the de-regulation of UK fire-safety standards I suggest we see a process through which discourse on this topic becomes caught up with a concern for its own side-effects. Ambitions to 'free' design practices from prescriptive codification come to depend upon those codes, at the same time as introducing additional layers of regulation that depend upon them.

42 Beck, *Risk Society*.p. 56

43 The material origins of both the concept of risk, and practices of risk-spreading, are nautical. The etymological root of the English word 'risk' is the latin 'riscus' (cliff), which came to mean by extension 'reef', 'difficulty to avoid in sea', and the likelihood of shipwreck. The first risk-spreaders were traders taking our insurance against shipwrecking, as they waited for their 'ship to come in'. 'Online Etymology Dictionary', accessed 11 February 2017, http://www.etymonline.com/index.php?term=risk.

44 Ulrich Beck, 'Living in the World Risk Society', *Economy and Society* 35, no. 3 (1 August 2006): 329–45.

45 Beck, *Risk Society*. p. 71

46 This is the fundamental diagram of liberalism as Foucault describes it, whereby the individual is subjectified both through the apprehension of danger, and the subscription to practices of safety. "The motto of Liberalism is "Live Dangerously", that is to say, the individual is constantly exposed to danger, or rather, they are conditioned to experience their situation, their life, their present, and their future as containing danger." Foucault, *The Birth of Biopolitics*. p. 66

47 Beck, 'Living in the World Risk Society'. p. 329

48 Beck. p. 345

49 Beck. p. 338

50 Beck. p. 340

51 Beck. p. 331

52 Pat O'Malley, *Risk, Uncertainty and Government* (Taylor & Francis, 2004).

53 'UCLA AUD : News & Events SYMPOSIUM: ARCHIVING RISK', accessed 29 July 2016, http://www.aud.ucla.edu/index.php/news/symposium_archiving_risk_398.html.

54 Bruno Latour, 'Is Re-Modernization Occurring - And If So, How to Prove It? A Commentary on Ulrich Beck', *Theory, Culture & Society* 20, no. 2 (1 April 2003): 35–48.

55 For Jordon Sands, it is the Meiji restoration that brings a significant shift in governing-mentality, at which point – due to the ambition for fixed capital accumulation – fire becomes an enemy of that state. See Sand, ' Property in Two Fire Regimes'. p. 64-65.

56 Edward Seidensticker, *Tokyo from Edo to Showa 1867-1989: The Emergence of the World's Greatest City* (Tuttle Publishing, 2011).

57 Charles Emmerson, *1913: The World Before the Great War* (Random House, 2013). P. 416-17

58 Carola Hein, 'Visionary Plans and Planners', in Nicolas Fieve and Paul Waley, *Japanese Capitals in Historical Perspective: Place, Power and Memory in Kyoto, Edo and Tokyo* (Routledge, 2013). p. 313

59 This translation is offered by Marie Sagnières. Original source Paul Claudell, 1923. "A travers les villes en flames" published in Ebisu (1999): *le Japon des séismes, 21*, pp. 35-47, translated and cited in Marie Sagnières, 'The Impact of Earthquakes on Japanese Cities: An Urban History of Tokyo', accessed 9 August 2018, https://www.academia.edu/11414299/The_impact_of_earthquakes_on_Japanese_cities_An_urban_history_of_Tokyo.

60 In this chronology I am drawing from Hein's detailed account of changing land practices and urban regulation in the aftermath of the Kanto Earthquake, see Hein, 'Shaping Tokyo'. pp 450-461

61 Carola Hein, 'Visionary Plans and Planners', in *Japanese Capitals in Historical Perspective* (New York: Routledge, n.d.), p. 315.

62 Gennifer Weisenfeld, *Imaging Disaster: Tokyo and the Visual Culture of Japan's Great Earthquake of 1923* (University of California Press, 2012). p. 329

63 I would like to thank Hannah Dalton, a student within my 2015/16 M.Arch design studio 'Tokyo Hauntology' for introducing me to the work of Kon Wajiro.

64 Wajiro Kon and Izumi Kuroishi, 'Selected Writings on Design and Modernology, 1924–47', *West 86th: A Journal of Decorative Arts, Design History, and Material Culture* 22, no. 2 (1 September 2015): 190–216.

65 Kari Shepherdson-Scott, 'Toward an "Unburnable City" Reimagining the Urban Landscape in 1930s Japanese Media', *Journal of Urban History*, 17 March 2016.during the first years of the Second Sino-Japanese War (1937-1945

66 Rem Koolhaas, *Project Japan: Metabolism Talks...* (Köln: Taschen GmbH, 2011). P. 341

67 Koolhaas. pp. 284-292

68 This aspect of the Metabolist legacy in explored in Meike Schalk, 'The Architecture of Metabolism. Inventing a Culture of Resilience', *Arts* 3, no. 2 (13 June 2014): 279–97.

69 Carola Hein, 'Visionary Plans and Planners' (New York: Routledge, n.d.), pp.312-316

70 In *The Making of Urban Japan* Sorensen describes the emergence of the 'cheap wooden apartment belt', its recognition as a specific fire risk, and its leading to a new planning principle of *machizukuri*, or 'community building' through incremental change. André Sorensen, *The Making of Urban Japan: Cities and Planning from Edo to the Twenty First Century* (Routledge, 2005). p. 269-271

71I was directed to the Shirahige-Higashi project through personal correspondence with Prof. Sekizawa and Nishida, whose verbal account of the political background of this project I draw upon here. Ai, Yukio, and Liam, Fire Regimes of Edo-TokyoGraduate School of Global Fire Science and Technology Tokyo University of Science.

72 Initial plans for the complex illustrate the urban and architectural lineage it shares with Edo castle, conceived as an urban 'maru', with a long defensive wall, and ceremonial protective gates. See Murao, 'Case Study of Architecture and Urban Design on the Disaster Life Cycle in Japan' (14th World Conference on Earthquake Engineering, Beijing, China, 2008), https://www.iitk.ac.in/nicee/wcee/article/14_S08-032.PDF.

73Personal correspondence with Prof. Sekizawa and Nishida revealed this ambivalent legacy of the project; they noted that the public and academic are split as to the merits of that scheme, some seeing it as a prototype to be repeated, others a costly mistake. Ai, Yukio, and Liam, Fire Regimes of Edo-TokyoGraduate School of Global Fire Science and Technology Tokyo University of Science.

74 I paraphrase Sir Arthur Streeb-Greebling, an invention of Peter Cook and Dudley Moore, the hapless proprietor of the 'Frog and Peach', a failing restaurant on Dartmoor which serves only two dishes; Frog a la Peche, or Peche a la Frog. "[Dudley Moore]: Do you feel you've learnt by your mistakes here? [Peter Cook]: I think I have, yes, and I think I can probably repeat them almost perfectly. I know my mistakes inside out." See 'The Frog and Peach', accessed 9 August 2018, http://www.faculty.ucr.edu/~currie/frog.htm.

75 Hein, 'Shaping Tokyo'. p. 450

76 Hein. p. 480

77 I cannot offer English-language published material supporting this claim, which was presented to me through personal correspondence. Ai, Yukio, and Liam, Fire Regimes of Edo-TokyoGraduate School of Global Fire Science and Technology Tokyo University of Science.

78 Ai Sekizawa's work for the National Research Institute of Fire and Disaster, and the School of Global Fire Science and Technology Tokyo University of Science, are exemplary. Indicative papers include A. Sekizawa, K. Sagae, and H. Sasaki, 'A Systemic Approach For Optimum Firefighting Operation Against Multiple Fire Following A Big Earthquake', Fire Safety Science 2 (1989): 423–32., and 'Post-Earthquake Fires and Performance of Firefighting Activity in the Early Stage in the 1995 Great Hanshin Earthquake' Yuji Hasemi, ed., Fire Safety Science: Pro-

ceedings of the Fifth International Symposium (International Association for Fire Safety Science, 1997).

79 Elizabeth Yuan CNN, 'Tokyo Sees High Quake Probability, Scientists Warn', CNN, accessed 8 December 2017, http://www.cnn.com/2012/01/24/world/asia/tokyo-quake-forecast/index.html.

80 The global reinsurance agency claims that Tokyo is "the most earthquake-threatened in Swiss Re's Mind the risk, a global survey of cities under threat from natural disasters. In addition, the Tokyo-Yokohama region is on the coast and close to waterways, which means the area is also exposed to river flood. If an event comparable to Tokuhu were to happen closer to Tokyo-Yokohama, the results could be devastating." See 'Mind the Risk: Cities under Threat from Natural Disasters', accessed 13 March 2018, http://institute.swissre.com/research/collaborations/in_focus/Mind_the_risk_cities_under_threat_from_natural_disasters.html.

81 See section 11.1 for a mapping of Swiss Re's finding against the current built fabric of the city.

82 Masako Tsubuku, 'Japan's 30-Year Building Shelf-Life Is Not Quite True | The Japan Times', accessed 8 February 2017, http://www.japantimes.co.jp/community/2014/03/31/how-tos/japans-30-year-building-shelf-life-is-not-quite-true/.

83 'Japan's Vacant And Abandoned Houses - Business Insider', accessed 20 August 2018, https://www.businessinsider.com/japans-vacant-and-abandoned-houses-visions-of-detroit-2013-5?IR=T.

84 For a review of significant changes to pyroseismic codes see 'Earthquake Building Codes in Japan', JAPAN PROPERTY CENTRAL (blog), 28 May 2011, http://japanpropertycentral.com/real-estate-faq/earthquake-building-codes-in-japan/. Also Atelier Bow-Wow, *The Architectures of Atelier Bow-Wow: Behaviorology*, 01 edition (New York: Rizzoli International Publications, 2010).

85 'Harvard Design Magazine: What Goes Up, Must Come Down', accessed 20 August 2018, http://www.harvarddesignmagazine.org/issues/3/what-goes-up-must-come-down.

86 Atelier Bow-Wow's Yoshiharu Tsukamoto defines this term in his essay "Escaping the Spiral of Intolerance: Fourth Generation Houses and Void Metabolism" in *Tokyo Metabolizing: Koh Kitayama, Yoshiharu Tsukamoto, Ryue Nishizawa* (Toto, 2010).

87 Yoshiharu Tsukamoto, 'Void Metabolism', *Architectural Design* 82, no. 5 (1 September 2012): 88–93.

88 Richards Koo and Masaya Sasaki, 'Obstacles to Affluence: Thoughts on Japanese Housing', *NRI Papers*, No. 137 (12 January 2008), https://www.nri.com/global/opinion/papers/2008/np2008137.html.

89 See *Outline of Urban Planning*, Section 5, "Urban Disaster Resilience", pp 119-120, 'Bureau of Urban Development Tokyo Metropolitan Government', accessed 2 September 2016, http://www.toshiseibi.metro.tokyo.jp/eng/.

90 A wonderful description of the morphology of the typical 'superblock' is offered by Shelton in his description of Gokisu, in Barrie Shelton, *Learning from the Japanese City: Looking East in Urban Design* (Routledge, 2012).

pp. 138-168

91 I am again informed here by the MArch thesis research of Hannah Dalton, who recognised that, within planning literature in Japan, continuous urban facades are identified as 'western' in character.

92 In the story, the 'Great Wall of China', Kafka's mason struggles to understand the construction logic of his imperial commissioners. Work proceeds in a piecemeal fashion - with work crews completing isolated fragments of wall within the vastness of the steppe – appearing to defer any possible military advantage. The mason concludes, though, that the purpose of the wall is not, in fact, to keep out the 'invaders from the north' but rather to create a subjectifying experience in which the scale of the individual labourer's accomplishment is rendered insignificant with respect to the scale of the empire. 'The Great Wall of China by Franz Kafka', accessed 20 August 2018, http://www.kafka-online.info/the-great-wall-of-china.html.

93 *Pet Architecture Guide Book* (World Photo Press, 2002).

94 This is another phrase introduced by Tsukamoto in his essay "Escaping the Spiral of Intolerance: Fourth Generation Houses and Void Metabolism" in *Tokyo Metabolizing*.

95 *Tokyo Metabolizing*. p. 119

96 My understanding of the fire-risk posed by *Roji* is again informed by personal correspondence with Ai Sekizawa. Ai, Yukio, and Liam, Fire Regimes of Edo-TokyoGraduate School of Global Fire Science and Technology Tokyo University of Science.

97 Kurokawa introduces his concept for the 'metabolism' of this tower, at the same time as calling for its preservation in Tokyo Art Beat, *Kisho Kurokawa Pt. 2: Nakagin Capsule Tower*, 2007, https://www.youtube.com/watch?v=9roy5mbz5fk.

98 'Tokyo's Tiny Capsules of Architectural Flair | The Japan Times', accessed 20 August 2018, http://cached.newslookup.com/cached.php?ref_id=263&siteid=2203&id=8628700&t=1412499065#.W3rECy-ZMdV.

99 'Save Nakagin Capsule Tower Project - Home', accessed 20 August 2018, https://www.facebook.com/SaveNakaginCapsuleTower/.

100 'Understanding the Lifespan of a Japanese Home or Apartment'.

101 Adrian made this argument in a lecture entitled *On Nations and Materials: a nineteenth-century question revisited in the twenty-first century*, presented at the 2015-16 cycle of the ESALA Research Seminar series. See 'ESALA Research Seminar Series | Edinburgh College of Art', accessed 20 August 2018, https://www.eca.ed.ac.uk/esala-research-seminar-series.

102 A Skeuomoprph is "[a]n object or feature which imitates the design of a similar artefact made from another material…'note-taking apps offer skeuomorphs of yellow legal pads, squared paper, ring binders, etc.' 'Skeuomorph | Definition of Skeuomorph in English by Oxford Dictionaries', Oxford Dictionaries | English, accessed 20 August 2018, https://en.oxforddictionaries.com/definition/Skeuomorph.

6: London
Engineering Uncertainty

Fire-safety, deregulation and the meta-engineering of governance

6.1
Architectures of Irrational Exuberance

They're the people you go to when you're tendering for the structural steel package on the CCTV building. You're worried about the construction sequence of the bridge section. Prior to their connection, the asymmetrically canted towers are subject to differential sagging and expansion due to self-weight and sunlight exposure. They'll simulate this deflection, design the towers to be self-supporting while incomplete, and confirm that they can only be connected at dawn, when they're both equally cool.[1] They're also the people to talk to when you want to know why the World Trade Centre Towers *really* collapsed, and what regulators should learn from the event. By developing software to simulate structural deflection through heat, they'll argue that the buildings would have collapsed due to the fire alone, regardless of the airplane impact.[2] Their Extreme Events Mitigation Taskforce will use this analysis to contradict the National Institute of Standards and Technologies, and call for a review of fireproofing codes for tall building.[3]

While such simulations and calculations are the stock-in-trade for engineers at Arup Associates, one of the world's largest building design consultancies, according to Rem Koolhaas they are also indicative of the 'post-modernity' of contemporary engineering.[4] Through their fastidious devotion to the empirical – always enabled and mediated by the 'hypnotic window' of computational analysis – the work of Arup Associates seems to transcend a dependence on universalising structural principles or their didactic architectural expression. If Ove Arup's 'Total Design' once stood for the (somewhat preachy) ambition to integrate architectural and structural rationalities, it now seems to have taken on a simpler yet more expansive meaning; that anything and everything can be designed:[5]

> [O]nce avid supporters of High Tech, modernism's moment of decadence, [Arup are], - in a form of emancipation - now exploring a kind of science fiction, meta-engineering as a total answer to everything.[6]

Architecture After Thrift

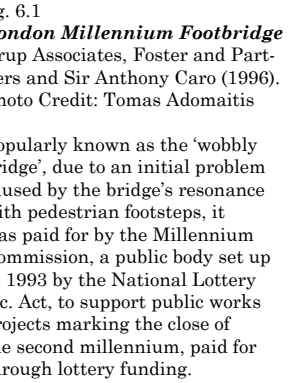


fig. 6.1
London Millennium Footbridge
Arup Associates, Foster and Partners and Sir Anthony Caro (1996).
Photo Credit: Tomas Adomaitis

Popularly known as the 'wobbly bridge', due to an initial problem caused by the bridge's resonance with pedestrian footsteps, it was paid for by the Millennium Commission, a public body set up in 1993 by the National Lottery etc. Act, to support public works projects marking the close of the second millennium, paid for through lottery funding.

These journalistic assertions are given more academic depth by Arindam Dutta's essay, "Marginality and Meta-engineering: Keynes and Arup".[7] Dutta charts the firm's contribution to the 'signature' architectural projects of nineties and noughties London, likewise noting an apparent loss of faith with modernist concerns for the expression of structural logic. If there is a meta-narrative to Arup's diverse projects of this period – on the South-Bank alone we can think of the Millennium Bridge, the Tate Modern, the London Eye, the GLA, or Anish Kapoor's Marsayas, not to mention the Gherkin, or the ArcellorMittal Orbit Gallery – it seems to be to stretch the envelope of what is technically do-able. Drawing upon Keynesian economic principles, Dutta situates these projects in related governmental thinking. He suggests, for instance, that we should understand the Modernist concern for structural and material efficiency as an instance of the classical economic concern for 'thrift'. Keynes specifically argued, in the context of Britain's post-war re-construction, against this govern-mentality; the architectures of thrift – while answering to the immediate exigency of the housing need – threatened to undermine the long-term value of construction as a mode of economic stimuli (and from a Keynesian perspective, the UK's post-2008 'austerity' politics could be subjected to a similar critique). By contrast, the govern-mentalities of Blairite Britain appear, to Dutta, like a late realisation of Keynesian economic principles. Here building design seems to forego thrift, adopting instead a kind of calculated 'irrationality' visible at the level of governmental and economic policy, as well as in architectural design.

Keynes famously argued that markets crash when the actors within them behave *too* rationally, becoming risk-averse. To combat this he suggested that macro-economic policy should structure a *lack* of awareness amongst actors so as to facilitate an irrational optimism in investment. He effected this, at a fundamental level, by separating the Bank of England from central government, ensuring that a kind of 'functional blindness' existed between political and economic decision making. At a more local level, the UK's National Lottery - which funded many of Arup's high-profile projects of this period – functions in a comparable way; it stimulates irrational micro-economic behaviour, so as to fund targeted macro-economic stimuli in the form of 'public works' (Keynes' favoured mode of economic intervention). Dutta points us, then, to the role which Arup's iconic projects played within this broader governmental diagram, at once legitimating, representing and enacting a political economy of irrational exuberance. But he also shows how, to some degree, Arup manage to 'transcend' this diagram, being one of the few actors who operate at all of its levels. In the process of delivering these ambitious and complex projects, the firm extended their schedule of services beyond those of mere building design, to include development accountancy, international legal advice, and the review and drafting of governmental legislation. That is, over this period, Arup's developed a consultancy platform through which they became capable of reflexively reconstructing their own conditions of practice. As Dutta


CITY OF LONDON
SCHOOL

puts it, from then on buildings ceased to be the *object* of their design, being only the "'front end' of an infrastructural project whose impetus is to transform the modalities of governmentality as such". [8]

Political Economy of Fire

Fire in London, and its effect on architectural design, is the subject of a dissertation in its own right. The Great Fire of London, whose 350th anniversary occurred in 2016, was perhaps the most influential event to have shaped that city, and the UK's building regulations as a whole. The event led to what are popularly considered our first building standards; the 1667 Reconstruction Act – which required that "No man whatsoever shall presume to erect any house or building, whether great or small, but of brick or stone"– and the Fire Prevention Regulations, of 1668.[9] The men who shaped those rules, and in so doing modernised our building construction practices, infrastructure provision and property law, were perhaps the most influential in the history of the city - Sir Christopher Wren, John Evelyn, Robert Hooke, John Locke and Nicholas Barbon.[10] Indeed their effect is still legible within the city; "the London terraced house is more or less the clauses of [these] regulations turned into bricks and mortar".[11] And other fires in the city have gone on to have nationwide effects; the Kings Cross fire of 1987 underpins much of our contemporary fire-safety standards, just as the Grenfell Tower fire of 2016 has prompted their comprehensive review.

But my ambition here is not to offer a city-portrait, noting the myriad ways in which London has been shaped by fire-safety regulation. Indeed, in this final chapter, my focus turns away from regulation altogether. Rather, my ambition here is to continue a line of thought begun above via Koolhaas and Dutta. I reflect here on the work of Arup Associates, the 'hypnotic window' of computational analysis, the aesthetics of structural expression, and the role of the building industry and its design services as a form of economic stimuli. However, what I wish to add to their accounts does relate both to the problem of fire, and to specific regulatory frameworks developed with the City of London Corporation. In what follows, I consider the some specific ways in which Arup Associates have sought to use the problem of fire to re-engineer the legislative frameworks of building practice.

The first section recounts the emergence of fire-safety science in post-war Britain, considering the pivotal role played by Arup Associates. At stake in this section will be the way in which the design ambitions and commercial pressures of architectural practice came to define the problems and concepts of this discipline. The particular focus will be on two initiatives led by Arup, in association with the University of Edinburgh, to free fire-safety engineering from 'prescriptive' standardisation by developing an empirical or 'performance based' definitions of safety. However, it will note a number of scientific and governmental problems implied by this ambition,

suggesting that they function rather by blurring, by making ambiguous, such definitions. The second section reflect on this constructed ambiguity suggesting that, as opposed to being a scientific deficit, it plays a particular political-economic role. Drawing on the work of Higgins, Kitto and Larner it will recognize Arup's work as an example of non-state actors exerting increased control over standardisation, blurring questions of 'public' and 'private' interest. And with reference to Foucault and O'Malley, it will suggest that the ambiguity constructed by these ambitions be considered part of a trend toward 'governing by uncertainty', constructing circumstances for irrational optimism through unequal distributions of risk and responsibility. In the final section, it offers a close study of a mode of computational analysis associated with these initiatives, Arup's *MassMotion* software package. By considering the utopian character of these simulations – the degree to which they act as a kind of wish-fulfilment– it will reflect on how the technicalities of architectural design can be construed as part of a broader process of subject formation.

6.2
Deregulating Safety

The governmental genealogy offered in Part 3 of this dissertation concluded with World War II, and the nationalisation of both the fire-services, and building regulation. The story offered in this section begins with that event. Wartime destruction created both the need and the opportunity to systematically review existing property patterns, construction technologies, and their associated urban and architectural paradigms. And within this review, it was recognised that existing building codes – often carried and enforced by local by-law – were a potential barrier to such systematic change. Indeed, like the country's demolished and decrepit building stock, these codes were recognized as a haphazard patchwork, built around outdated practices, and the arbitrary contingencies of past events.[12]

We have already noted how our British Standard for safe egress time, the '2.5 minute rule', is based upon a single historical event, occurring in Edinburgh in 1911. 3000 theatregoers reportedly escaped from the building in the time it took the band to play the British National Anthem. In section 3 we reflected on the fact that there is of course no empirical 'science' to the 2.5 minute rule, the event it universalises being so particular. But the redundancies and deficiencies of this code are not unique. Another highly consequential code - The British Standard Fire Test (BS476) – is troubled by similar contingencies. This standard, used by engineers to test the fire-resistance of materials and structures, is based upon a specific fire, originally recorded in 1932. That fire was not an actual building fire, but rather a controlled experiment, which was conducted in the firebox of a steam-locomotive. By reproducing this fire in laboratories around the world, it offers a control-variable for purposes of comparison. However, it does not offer a reasonable representation of the development of any possible building fire. As a result, our commonly used ratings for fire-resistance ($^1/_2$ hr., 1hr, 2hr etc.) bear little relation to likely performance. When cross-referencing these guidelines to assess whether an occupant can flee a building before it is compromised by fire, we are in fact checking whether a navvies can shovel coal quicker than a band can play.

Magic Act and Magic Numbers

That is, at the same time as calling for the universalisation of building regulations, the post-war review of these legal frameworks brought with it a critique, one that sought to find a more empirical basis for standardisation. Seeking to free building practices from arbitrary limits, for instance, the UK government set up the Fire Research Station at Borehamwood in 1949. The ambition of this Station was to develop a scientific basis for the modelling of fire behaviour as a means to overhaul building standards. This work provided the basis for the development of 'Fire Safety Engineering' as both an academic discipline and a field of design consultancy. David Rasbach, who began his career at Borehamwood, went on to establish and lead the world's first Fire Safety Engineering programme at the University of Edinburgh in 1974, developing a curriculum which has since been recognized as the 'core' of any degree in this field. [13]

His successor, Dougal Drysdale, wrote what remains its definitive textbook.[14] Through their work, the UK and Edinburgh established itself as the centre of a global network of fire-safety expertise. Today this includes the Universities of Tokyo, Lund, Berkeley, Maryland, Worcester Polytechnic, and Queensland.

fig. 6.2
Fire-Safety Strategy, Pompidou Centre
IABSE Proceedings P-61/83,
IABSE Periodica 2 / 1983, p. 78

A disposition *against* prescriptive codification can be seen in the early research in this field, well characterised by the writings of Margaret Law. Law was a colleague of Rasbach's at Borehamwood, and went on to establish the world's first Fire-Safety consultancy with Arup. In "Magic Numbers and Golden Rules" she outlines her critique of existing fire-safety codes, both as arbitrary science, and evidence of clumsy government. Of the travel distances inferred from the 2.5-minute rule, she complains; "the regulatory authorities are comfortable with [these] magic numbers. If the distance to a door is no more than 45m, the building is safe. They need to think no further."[15] This 'magic' was hard to de-bunk, though, as it served a broader disposition of government:

> [T]he transfer of technology from researcher to the real world is subject to a ratchet mechanism. Because fire research is almost entirely bound up with safety issues, there is an inherent prejudice in favour of releasing and applying results at the earliest stage if lives can be saved… [while no such pressure exists to disseminate] research carried out which shows that the current approaches to fire safety may be overly restrictive. [16]

Grand Gerberettes

Law's writings paint a picture of a discipline which sees itself struggling against government, enrolling the ambitions of contemporary design practice as a means to support a perceived need for empirical fire-science: "as soon as [regulations] frustrate design, we should be able to re-establish the rationale behind the rules and thereby develop new approaches".[17] This attitude, of course, resonates both with Arup's 'Total Design' philosophy, but also with the commercial interests of a design consultancy, and its clients; reading Law's account, the goal of fire-safety engineering appears to construe safety as another case-load to be addressed through bespoke, integrated solutions, balanced against competing concerns and interests.

The way that specific projects and commercial trends shaped the discipline are well described by Barbara Lane, Fire Engineering Practice Leader at Arup Associates and Visiting Professor in Fire Safety Engineering at Edinburgh University.[18] One of the first signature projects of fire-safety engineering was that of the *Centre George Pompidou* (1971-77). Piano and Roger's design called for the use of exposed structural steel, something that until then had not been permitted due to the need for fire-insulation (think of Mies' decorative columns at the Seagram Building, completed only a decade before the Pompidou brief). Law had developed a num-

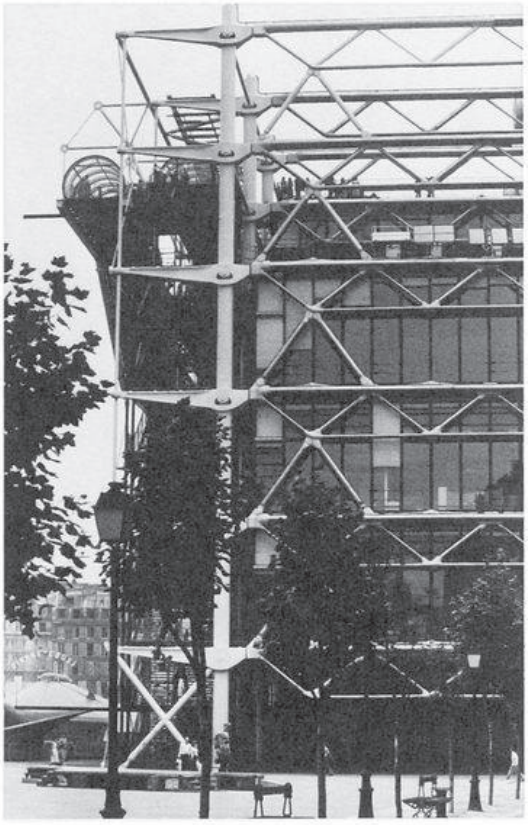


Fig.3. - Pompidou Center
Paris

3.5) Centre Pompidou, Paris, France (19)

Architects : Piano and Rogers,
Structural Engineers : Ove Arup & Partners

Much of the structure of this building is exposed externally (figure 3). Where calculation of the external fire exposure showed protection of the elements to be necessary to reach the 2 hours fire rating required, protection was provided generally by water cooling or by shielding although a few parts have conventional fire protection. The Centre Pompidou has a steel superstructure rising above a concrete substructure. The main building has six storeys above ground, each 7 m high and 166 m long. The main lattice girders span 44.8 m between short cantilevers projecting from the main columns, the outer ends of the cantilever members being restrained by vertical ties. The glazing line generally follows the junction between the lattice girders and cantilever brackets. The main columns are 1.6 m outside this line and are water filled for fire protection, circulation being achieved within each column by pumps. The cantilever brackets are 7.6 m long; thus the outer line of tension "columns" and associated bracing members are 7.6 m from the windows. Calculations showed that in the event of fire, all the members on the outer plane are protected by virtue of the 7.6 m distance from the windows; the cantilever brackets are shielded by fire-resistant panels in the façade. There are sprinklers on the external walls and the cantilevers. Horizontal bracing members close to the windows would be lost in a fire, but with each floor divided into two compartments, the loss of a proportion of the bracing does not endanger resistance.

Fig. 4 - Bush Lane House
London

3.6) Bush Lane House, London, England (20).

Architects & Structural Engineers : Arup Associates.

Prior to the construction of this building (figure 4), water cooling had only been used for the protection of vertical columns, since its use for beams raises considerable difficulties in ensuring that adequate controlled water flow occurs and no steam pockets develop. In Bush Lane House, water cooling is used for the external structural steel and protects columns, lattice members, and a critical top horizontal member. Bush Lane House provides eight office floors above a first-floor plant room. Each typical floor is approximately 35 m long x 16 m wide, supported by the lift core and three columns set 11 m from the extremities of the building. The stainless steel lattice which transmits the floor loads is external to the building envelope and leaves the office space uninterrupted. The steel members are water filled and inter-connected, so that in the event of fire the water circulates and steam is vented at high level or separated in a tank on the roof. This tank also serves as a reservoir to replenish and keep the system full of water. The patterns of water flow, maximum potential steel temperature, and the amount of water storage were all established by calculation.

fig. 6.3
Fire-Safety Strategy, Bush Lane House
IABSE Proceedings P-61/83, IABSE Periodica 2 / 1983, p. 79

ber of ways to achieve the fire-rating of structural steel without insulation; through the massive size of structural members, through water-cooled hollow-sections, or through spatial set-back. At Beaubourg she deployed all of these techniques: the Pompidou's exterior compression columns are hollow and water cooled, and set 1.6 metres outboard of the glazing; the slender, solid tensile members are pushed a further 7.6 metres away from the fire-load; the connecting 'petit gerberettes' are, of course, not 'petit'. The project is rightly recognized, in these details, as a successful integration of architectural, structural, and fire-safety thinking. This was not always seamless, though; it was Law who frustrated Piano and Rogers ambition for a fully open and uncompartmentalised interior. In order to limit the number of structural elements that might be lost in a fire, she required the building be split into two fire compartments. Concurrent with the Pompidou, however, Arup pushed these logics further in a building of their own design, Bush Lane House (1971-74), where a hollow-section water-cooled primary structure is pushed outboard of the envelope, creating a completely open and uncompartmentalised floor-plate.

Big Bangs and Big Boxes

Lane goes on to describe how, in the 1980s, two further developments put fire-safety engineers in wider demand. Thatcher's de-regulation of the financial services sector – her 'Big Bang' – created enormous demand for office space within the City of London. The fashion for atria within these building brought about calls for a commensurate de-regulation of fire-safety design, presenting legislators with challenges for which they did not yet have rules. At Lloyds of London (1978-86), Arup pioneered the use of Computational Fluid Dynamics to model smoke behaviour. Through this, they demonstrated that the atrium, while allowing for the vertical movement of smoke, likewise provided a reservoir for it, which would allow occupants to escape without succumbing to fumes. Again, fire-safety concerns were not always seamlessly integrated; the building was initially designed as a steel-framed structure, but at the time this could not be proved safe, the steel being famously replaced by concrete late in the process. The corporate atrium travelled the world as a building typology, and in so doing, took Arup with it. When they arrived in cultures with less developed or looser regulatory regimes – Russia, the UAE, and later China – Arup's appeared not only as design consultants, but also as regulatory advisors, and performance verifiers, so beginning a path toward governmental 'meta-engineering'.

In the UK of the eighties, the professional context was itself being deregulated. The Monopolies and Mergers Commission and later Warne Report disbanded architect's fee scales and protection of function, opening the market to alternative forms of design consultancy. At the same time, the emergence of Design and Build contracting created new forms of procurement, within which the architect no longer assumed their 'traditional' role of contract manager, allowing engineers or quantity surveyors to take the role of lead 'designer'. Due to their ability to gain exemption from prescriptive codes,

and to self-certify designs, firms offering diverse, non-architectural specialisms developed a market advantage. Fire-safety engineering was as an important aspect of this advantage; in the context of Big Box retail and distribution, for instance, the ability to design large, open-plan buildings with exposed structural steel offered significant cost-savings, and gave the discipline its reputation as a form of glorified 'value engineering'.

fig. 6.4
Fire Dynamics Modelling of 3 storey fire, World Trade Centre Tower
Figure 18. Usmani, A. S., Y. C. Chung, and J. L. Torero. 'How Did the WTC Towers Collapse: A New Theory'. *Fire Safety Journal* 38, no. 6 (1 October 2003): p. 523

Starchitects and Sky Lobbies

In the 90s and noughties the development of the 'signature' architectural project as a vehicle for sovereign wealth fund investment put Arup in yet more demand. The self-consciously unconventional designs of a Gehry, Hadid, or Koolhaas created technical challenges that further secured a demand for engineered responses. The Seattle Central Library offers an example of this, which accidentally evidences the differing legal stature of architect and engineer: while Koolhaas was ironically complying with the city's zoning laws as a tactic to maximize the permissible volume of the building, Arup was circumventing the city's codes for egress, compartmentation and smoke control - facilitating the large interconnected vertical spaces, and exposing parts of the building's structure – and in turn, establishing itself as a body with greater expertise than that of the regulatory authorities.

Most recently, the aesthetic economy of large, open-plan spaces and unprotected steel structures has been best described through a series of office projects in London. Plantation Place (2004), which has a completely unprotected steel frame and unimpeded floor plates, was the first project to gain regulatory approval through the use of 'Dynamic Fire Modeling'. This computational mode of simulating fire-spread in buildings was used to demonstrate that, as long as the amount of combustible material within the building is limited, fire will burn out before reaching the heat required to melt structural steel. It is this form of modeling that Arup used to study the structural collapse of the World Trade Centre Fire, but also to argue for the safety of its fire-strategy at the Heron Tower (2007-11). Prior to the World Trade Centre fire, regulators had not considered the possibility of simultaneous fires occurring on adjacent floors within a high-rise building: floors are usually 'compartments' and designed to stop fire spreading vertically. September 11th proved that this could happen, and Dynamic Fire Modelling was used to argue that it if it did, existing codes were not sufficient to prevent collapse. By showing that such risks exist, Arup constructed a market for design-services needed to design them out. And by doing so, they found themselves in a position to do things that would otherwise have been illegal. At the Heron Tower Arup's fire-engineered the design of a tall building that omits fire-proof cladding so as to expose structural steel, and incorporates three-story 'sky-lobbies' which break from floor-to-floor compartments. Neither of these would be possible following prescriptive standards, nor without arguments based on detailed scenario modelling. That is, the Heron Tower acts

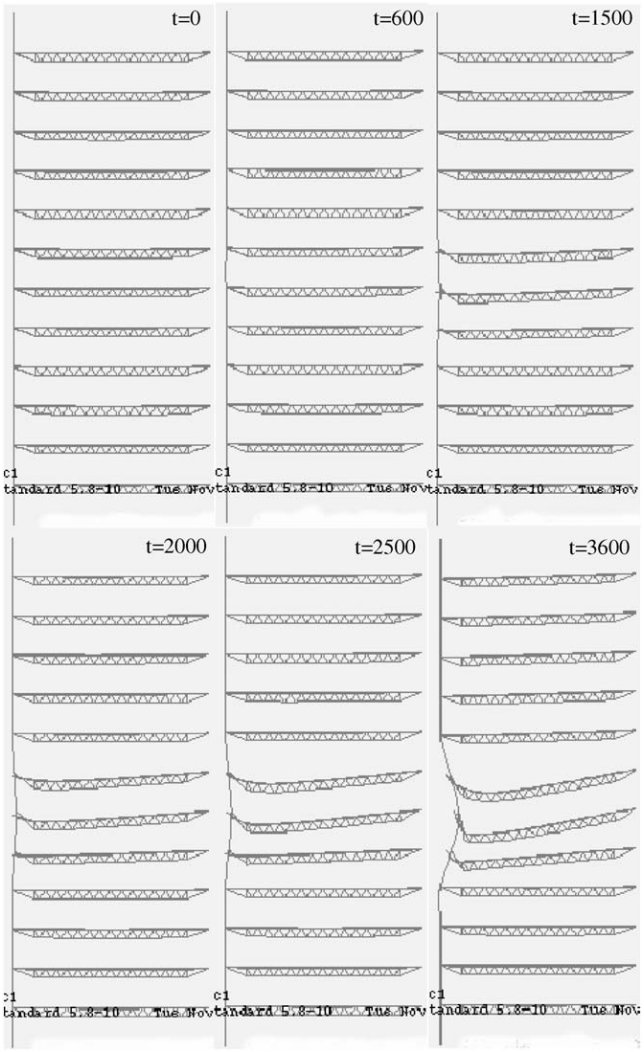


Fig. 18. Model showing collapse, fire scenario C, $T_{max} = 600^{\circ}C$ and $a = 0.001$ for fire on 2 floors.

The fundamental collapse mechanism does not however change. The failure envelope for the two column model is presented in Fig. 19. It may be noticed now that no collapse occurs for any of the 1-floor fire scenarios. However, collapse still occurs for 2-floor fire scenarios but at relatively higher temperatures (700°C and over). However, for the 3-floor fires, collapse still occurs at temperatures as low as 500°C, even with scenario C.

The results of this model are presented here as it shows a contrast to the unstable behaviour seen in the previous analysis. Fig. 20 shows the deflections of the fire

fig. 6.5
3 Storey Sky Lobby
Heron Tower, Kohn Pederson Fox (2007). Image credit: Rob Wrathmall

to normalize aspects of 9/11. By simulating the conditions of that accident, Arup's found ways to recreate that circumstance, and to demonstrate that it can be 'safe'.

Epistemological Limit

The approvals process for Plantation Place and Heron Tower demonstrate the most recent ways in which Arups are attempting to re-engineer the UK's legislative framework. The use of Dynamic Fire Modelling software offers a way to displace BS 476, the British Standard Fire Test, and so to allow for the bespoke simulation of design proposals, instead of relying on generic assumptions attached to discreet wall build-ups. In parallel, Arup have developed forms of computational analysis that would seem to overcome the arbitrary limits of BS9999, the '2.5 minute rule'. Through the development of agent-based evacuation models – which simulate the behaviour of building occupants in response to a fire-scenario – Arup can simulate the effects of design changes on likely occupant egress time, and so gain relaxation on prescriptive guidelines for maximum travel distance. These forms of simulation are supported by current UK building legislation as a means of verifying compliance with its 'functional' or 'performance-based' standards. Through the use of this form of verification, clients and designers can avoid the need to comply with the standard codes, as long as they demonstrate a solution is deemed 'safe'.

The ambition for a performance-based standardisation of fire safety has run into an epistemological problem, though. Despite the ambition of fire-safety scientists, they have failed to offer a more empirical definition of 'safety'. As we discussed in Part 3, the definition of 'safety' cannot be reduced to a clear legal or technical definition, but rather depends upon specific social and political conditions of possibility. Working in academic abstraction, fire-safety engineers cannot re-define what is considered socially acceptable. This creates a kind of ironic limit inherent within their project, noted by Vincent Brannigan, emeritus Professor of Fire and Law at the University of Maryland. In "Fire Scenarios or Scenario Fires? Can Fire Safety Science Provide the Critical Inputs for Performance Based Fire Safety Analyses?", he notes how this problem – a limit as to what fire-safety science can 'know' - surfaces in the technical challenges of performance-based codification: computational modelling for egress and fire-spread are *themselves* based upon assumptions, standards and codes, indeed often the same codes upon which prescriptive standards are based. [19] That is, despite the sophistication of fluid and agent-based analysis demonstrated by human, fire and smoke dynamic modelling, the regulatory purpose of this software is still to demonstrate that a building can be evacuated within the duration of the British National Anthem. This is, at a practical level, because fire-engineered solutions are only lawful to the degree that they can be proved to be 'as safe' as the equivalent prescriptive codes, which still offers the only legal definition of 'safety'. But what it suggests more generally is that ill-formed concepts such as 'safety' cannot be

known other than through the definition of acceptable limits; that the 'prescriptive' is epistemologically deeper than the 'performative'.

Reflexive Tightening

This does not mean that such regulatory changes have no effect on what can and can't be designed. Performance-based codification allows designers to equate other design features - sprinklers, smoke reservoirs, pressure differentials, the eradication of combustible materials, or enhanced occupant training programmes – with additional escape time. The 'regulatory-space' of these codes, therefore, creates a kind of situated freedom, through which designers can exchange one mode of compliance with another. But given the economic and economising nature of its commercial application, this trade-off can lead to some practical counter-productivities. Since the prescriptive code remains the benchmark of 'safety', design freedom (and cost saving) is bought by the creative interpretation of margins of safety, through the introduction of further assumptions. As a result, the material effect of fire-safety engineering is often to legitimate constructional arrangements that could be considered fundamentally less safe: deeper plans, less means of escapes, less fire-protection, less compartmentation, coupled with greater dependence on active management. Furthermore, this ambition to 'free' design from regulatory assumptions actually adds to the number of assumptions embedded within the design-model, at the same time as suggesting the need for additional controls on the forms of permitted occupancy. As Brannigan notes, It is logical to assume that, as such regulatory models are mainstreamed, new forms of regulation will be required to ensure that the built environment complies with these models, in terms of use, furnishing and occupancy levels. Thus, in this case, the creative freedom of the designers is bought at a cost to the freedom of the occupant; the metaphorical loosening of our Regulatory Space implies a reflexive tightening of our literally regulated spaces.

Zero Tolerance

We can see the emergence of these new, *more* highly regulated practices, in some of the flagship projects that Arup have recently been involved with. At Birmingham New Street Station, whose re-design involved computational analysis of occupant through-flow as well as escape, Arup analysed not only the final design, but are also providing real-time simulation of every stage of the construction process, simulating the location of construction work every day in relation to passenger activity:

> [MassMotion] brings industry-standard data on the behaviour of people in crowds, [and] this is overlaid with the detailed New Street rail timetable, generating accurate visualisations of what will happen with time, no matter how small or large the construction stage is. Potential bottlenecks, which might have been missed by hand calculations,

> are revealed and can be resolved by adjusting plans, hoardings and signage accordingly.[20]

Likewise, the architectural innovations at Heron Tower have placed additional burdens on the building's occupants. Chris Stoddart, the first head of the Heron Tower, won 'Facilities Manager of the Year' award for his role in educating and monitoring occupant activity. He told the Building Research Establishment that the challenges of managing emergency evacuation in the building demanded: "a Zero tolerance approach to controlling behaviour; Clear command; CCTV; Clear, consistent communication [and]; Strong Management".[21]

Political-Ineconomy

That is, recent fire-safety initiatives, often tied to processes of deregulation, have less to do with this original government problem, being driven more by concerns over cost, or aesthetic factors, than in improving safety. And despite not offering improvments in regulatory outcomes, these developments seem to entail an increase in the *cost* of that regulation, in the form of increased consultancy work in building design, its legislation, its verification, and its management. Plantation Place and Heron Tower were only possible due to the close collaboration between Arup, the City of London, and its Fire Rescue Services. Eager to ensure the Square Mile remains competitive in the market for office space, the City have required that its fire-fighters and regulators undertake secondments with Arup to ensure they understand the complexity of fire-safety solutions undertaken in these projects.

But this increased cost does not occur within government, rather it is displaced to the private sector. That is, while depending upon existing prescriptive standards, performance based forms of standardisation bury these requirements within design services. The epistemological limits identified by Brannigan are precisely the sleight of hand that allows for this displacement. These new regulatory frameworks scientise the fundamentally social decisions that our standards are based upon, blackboxing them, and so making them even more embedded, invisible. And it is by doing so that they effect a shift in the locus of decision-making. Performance based modes of standardisation shift the space of consequential decisions away from the state – whose agents do not have the expertise to understand detailed fire-safety reports - and into the sphere of design consultation, within which commercial interests hold a powerful sway. In practice performance-based design is only employed when it offers the potential to eliminate prescribed margins of safety through the creative deployment of approximations and assumptions. That is, this change in the technology of government brings with it a change in rationale, and perhaps also what we could call a change in subjectivity; regulation changes from an activity in which we recognise common threats, and develop universalised means, to one through which we make calculated decisions balancing individual opportunities for profit and loss.

6.3
Governing by Uncertainty

Much in this account of Arup's work resonates with literatures on standardisation, governmentality, and the constitution of a neoliberal subjectivity. In *Calculating the Social: Standards and the reconfiguring of governing*, Kitto, Higgins and Larner offer an overview of recent social-scientific research on standardisation. They attribute a surge of interest in the topic to questions as to how "governing is achieved in a globalizing world where the state is no longer the main form of regulation, and particularly how public and private entities might most effectively shape conduct 'at a distance'". [22] Summarising the work of this field, they note traits that will strike us as familiar: the rise of international authorities and experts in standard-setting; the global diffusion of the standards they create; the blurring of public and private interests entailed; the 'blackboxing' of social concerns within technical guidelines; and resultant questions for democratic accountability. But beyond these general observations – which operate at the level of governmental rationality – these authors call for a more materially focused analysis of the 'work' of standardisation and its relationship to neoliberalism. They ask if certain types of standards produce certain types of effect, if they reconfigure relations between public and private, and if they privilege specific sites, spaces, and agents.

This brief account of Arup's engagement with fire-safety standardisation allows us to sketch a provisional response to some of these questions: The shift in type from prescriptive to performance-based standardisation does seem associated with different social impacts. Where state-based prescriptive standardisation is universalising in nature and intent, performance-based standardisation, which operates through bespoke solutions and privatised verifiers, have targeted impacts for discreet clients. Despite their claim to supplant prescriptive forms of standardisation, performance-based codes in fact depend upon them, or to put that another way; this privatised mode of 'government' does not replace the state, which it ultimately falls back upon as arbiter of 'safety'. Nonetheless, these mechanisms create a clear privileging of both large-scale corporate clients, and of consultants such as Arup; this reconfiguring of legislative practices is disposed both toward the interests of corporate clients, and toward the construction of a market for services provided by their consultants, who come to act as designers, verifiers, and advisors to government and other public services.

Creative Compartments

These problems are, to some degree, recognized both by the sector and by government. In a recent report[23] commissioned by the Scottish government, Brian Meacham – associate professor at Worcester Polytechnic, Massachusetts - suggests that, while the state of performance-based fire-safety standardisation in Scotland is 'not dire', it has a number of associated problems, centering around the verification of fire-engineered solutions. The report – which draws extensively on consultation with Arup – recognises a widespread concern

that this mode of standardisation is viewed as a means to save money, as opposed to deliver safe buildings. Further, it finds the UK lacking in expertise, within the construction industry, fire-services, regulatory bodies, and even within the fire-safety engineering community (which is not professionally certified). This lack of expertise makes it difficult to verify the safety of engineered solutions. And since engineered solutions often achieve only minor deviations from prescriptive requirements, it argues, the practice as a whole creates a disproportionate burden on statutory bodies. Putting this in other words, we could say that while seeming to 'free' design practices from the burdens of clumsy government, the practice effects a transfer of cost-saving from private clients to the public services, with an overall net-loss of cost-efficiency.

fig. 6.6
A Disaster Waiting to Happen
Wilkinson, Matt. 'Hospital Hit with £380million Bill after It's Revealed Builders Had Failed to Fire-Proof It'. *The Sun*, 30 August 2016.

We might see the recent Private Finance Initiative (PFI) hospital scandal in England, in which a raft of hospitals, constructed under PFI, have been found wanting in terms of fire-safety,[24] as evidence of some of these concerns. These buildings used fire-safety engineering to allow them to be 'creative with compartments', deviating from both national standards and the strict fire-code of the NHS [25]. Whether the resultant buildings are 'safe' or not is not the issue I wish to raise, though; rather, the fact that Arup, who designed a number of these buildings, are now also acting as the expert witness determining whether those designs are indeed safe, would seem to demonstrates the asymmetry of knowledge that characterises this field.

Environmental Technology

To connect these practices with a neoliberal govern-mentality is, of course, not hard; the move away from prescriptive to engineered solutions to safety clearly follows a trajectory of privatising previously public functions, through the creation of a market for social goods. The counter-productivities noted above, I think, already offer a powerful critique of this trajectory, which in practice appears more 'clumsy' than the overtly governmental approach it would supplant. However, my interest here is to suggest a deeper connection that operates not through the governmental *rationalities* of performance-based standardisation, but rather through its blind spots and aporia. That is, just as the previous section employed the way fire in Edo could be construed as useful for a particular govern-entality, in this chapter I want to to suggest that uncertainty over what we define as 'safe' likewise serves a broader function within neoliberal government. The epistemological limits explored above seem a means to allow commercial actors to carve out a space of action, while ensuring that responsibility for that action remains with the state.

One aspect of the history of Liberalism that Foucault offers in the *Birth of Biopolitics* is that of the changed significance of the 'marketplace' for succesive eras of government: If in the middle ages it

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'A DISASTER WAITING TO HAPPEN'

Hospital hit with £380million bill after it's revealed builders had failed to fire-proof it

Two-years of round-the-clock renovations required as urgent safety work begins to rectify mistake

EXCLUSIVE by MATT WILKINSON
30th August 2016, 12:26 am | Updated: 30th August 2016, 8:35 pm

COMMENT NOW

URGENT safety works have begun at a £380 million PFI hospital after inspectors found it was built without fire protection.

University Hospital Coventry opened just a decade ago but will now need two years of round-the-clock renovations to make it fire safe.

No smoke ... University Hospital Coventry opened just a decade ago but will now need two years of round-the-clock renovations to make it fire safe

The 1,250-bed unit is the country's most expensive private finance initiative project — a scheme in which private firms fund, build and maintain public sites for the Government.

Three other PFI hospitals are also having emergency fire-proofing, including Royal Derby, Walsall Manor in the West Midlands, and King's Mill in Mansfield, Notts.

Work at all four sites is set to cost developer Skanska, which was paid millions to build the hospitals, an estimated £47 million to fix.

But there are fears over safety standards at all PFI hospitals after fire officials found others in Hereford, Peterborough and Carlisle were built without fire-proofing.

was a site for the dispensing of Justice (through the fixing of a 'fair price') by the late-twentieth century it had come to be seen as a site through which we recognise ourselves as individual 'economic subjects' (and so self-regulate our activity in accordance with 'rational' self-interests). Since individual actors must here be construed as 'free' to determine those interests, this change entails a shift in the mode of governmental intervention. Governments must try to avoid the direct exertion of discipline (telling us what to do; setting prescriptive requirements), instead acting on the 'environment' in which actors 'play'. The theme programme of neoliberalism, for Foucault, is therefore not exhaustive discipline, nor exclusionary logic, but rather the "optimizing of systems of difference, in which a field is left open to fluctuating processes".[26] The "environmental technologies" of contemporary government offer "loose frameworks that create the possibility of play". Their purpose is not to determine governmental ends, but to be "open to unknowns, [through a] freedom of interplay between supplies and demands". Governmental action is here limited to the "the regulation of environmental effects [ensuring] the principle of 'non-damage'", and to constructing the "possibility for individuals to regulate the effects of the framework".[27]

Capricious Government

The work of Pat O'Malley connects these broad and abstract rationalities to discreet and concrete governmental technologies. In *Risk, Uncertainty and Government* he suggests that risk and uncertainty are not universal or natural phenomena, but rather techniques of governing with specific and divergent political histories[28]. His account of the role of these concepts within neoliberalism resonates closely with Foucault's 'environmentality' of government; the calculative practices that reframe uncertainty as risk facilitate economic speculation around wealth production projects, while providing an infrastructure that limits individual or corporate loss. The construction of risk imaginaries and mitigation technologies creates new and important governmental roles for technical experts, for those people who can, with 'reasonable foresight', construct the conditions of 'play'. And it is in relation to these questions of uncertainty, risk, and 'reasonable foresight', that I think we can connect Arup's meta-engineering of government back to the Keynesian concerns we began this reflection through. As we have seen, for Keynes the fundamental problem of market economies is that they behave *too* rationally, so tending toward risk-aversion and market collapse. The role of government, therefore, was to maintain - to render politically sustainable – the 'capricious' character of our economic games:

> Is our expectation of rain, when we start out for a walk, always more likely than not, or less likely than not, or as likely as not? I am prepared to argue that on some occasions none of these alternatives hold, and that it will be an arbitrary matter to decide for or against the umbrella. If the barometer is high, but the clouds are black, it is not always rational that one should prevail over the other in our minds,

> or even that we should balance them, though it will be rational to allow caprice to determine us and to waste no time on the debate.[29]

What I wish to argue, then, is that environmental technology of performance-based codification works towards the end of caprice, both by safeguarding against loss (of life, of property), but also by creating opportunities for advantage, and profit. Uncertainty plays a fundamental role here. Problems of fire-safety call upon and circle around a 'real' uncertainty; the possibility of an actual building fire, the ways in which that fire might develop and spread, the locations within which smoke might pool, and the way people might behave in response to these events. These real uncertainties are simulated with more-or-less reasonable foresight, and in so doing can be subjected to the probabilistic accountancy of 'risk'. But at the same time, fire-safety engineering actively *constructs* another form of uncertainty; that question of what we define as 'safe'. Indeed, this uncertainty is its condition of possibility/impossibility; fire-safety engineering only exists to the extent to which it can call existing standards into question *at the same time* as deferring to them. Engineered solutions are required to demonstrate that they are 'as safe as' prescriptive requirements; this formulation defines a space of legal and design flexibility that nonetheless avoids assuming actual governmental responsibility. That is, at the same time as appearing to be a discipline that subjects fire-dynamics and occupant behaviour to empirical analysis, with a view to increasing the safety of our built environment, fire-safety engineering black-boxes the fundamentally unscientific question of 'safety' as a means to legitimate often empirically less-safe environments. It is at this level that we can add to Dutta's suggestion that Arup, now through fire-safety engineering, contribute to a Keynesian reconstruction of government: by constructing a space of uncertainty within our definitions of 'safety', they make room for capricious decision making. The space that this creates secures a market advantage for some, at the same time as isolating them from particular financial risks. Perhaps it is here that we could say of both contemporary engineering – as Foucault does more broadly of neoliberalism – that its motto is 'Live Dangerously'; what Foucault meant by this motto was not that life in advanced capitalist societies was more dangerous than in any other – far from it – but rather that our experience of danger plays, within those societies, and important subjectifying role, one that building design is clearly caught up in.[30]

6.4
Fantasies of Fire-safety

Mesmerism and MassMotion

The individual agents are faceless, emotionless. They move at an unnervingly slow and steady pace, neither rushing, nor dawdling, as if in a trance. They maintain a constant distance between themselves and their neighbours, endowed with both respect and patience. They know where they are going; it might be the platform of a train that forms the next leg of their itinerary, or a place of safety from which to escape a fire, or a terrorist attack. Likewise, they know how to get there: they have internalised a perfect knowledge of the building's layout and are able to determine the quickest route from any location to their final destination. But while acting individually, and rationally, they know something of doubt, and respond to the dynamics of a crowd. Should a bottleneck form, they can assess the relative speed of those around them, in relation to that of all agents, and re-evaluate their route. That is, acting with an instantaneous and transparent knowledge of the system, and of all other agents, their individual, rational and self-interested decisions aggregate to ensure that total occupant flow is efficiently directed to all available routes.

I'm describing *MassMotion*, the most recent egress simulation package developed by Arup's software arm Oasys. The package – used by Arup in its consultation on the phasing of works at Birmingham New Street Station, and in the verification procedures it has developed with the City of London Corporation, offers "[t]he most advanced pedestrian simulation and crowd analysis tool available anywhere. Capable of simulating hundreds of thousands of people within a matter of hours…". [31] And it is in this software package that we see how the technologies of fire-safety engineering embed the assumptions written into prescriptive standards. The width of shoulders, the rate of movement, and the queuing behaviour that is programmed into these avatars are those defined by the regulatory assumptions of post-war building studies, British Standard 9999, and Scottish Building Standard 2.9.3. If we simulate a fire at the

Empire Palace theatre using this software, these obedient audience members will escape in precisely 2.5 minutes.

Mise En Abyme

I want to dwell on this scene because I think it offers, within the drama of fire-safety more generally, a kind of 'mise en abyme'. That is, I think it offers, within this dissertation as a whole, a play within a play. In these computational simulations we see recreated the fantasy that eluded the designers of the 2.5 minute rule. Through the use of this simulation software to analyse and modify building designs, we see superimposed two different interpretations of the British National Anthem; a patriotic crowd that moves calmly and slowly to the beat of this tune, and a building that has been designed as an echo of its duration.

The concept of a mise en abyme originates from heraldic design; it is a sign set within ('placed in the middle' of) another sign, and so changing its meaning. Within the history of western art we see it in many forms; picture frames caught within the frame of a picture, or plays set within other plays. It is a device used to create a moment of reflexive self-awareness in an audiences; a theatre troupe stages a play, to tell one audience member (called Hamlet) that they understand the bigger plot he himself is hatching. At the same time, another audience, the spectators, are prompted to reflect upon the play they are watching (also called Hamlet), and to consider the bigger dramas it might point to, beyond the walls of the theatre.

I have suggested a concern that this particular piece of software – and the ambition toward performance based design in general – black-box a kind of ignorance. However, in order to conclude this chapter, I want to suggest that its simulations are also accidentally enlightening; that they offer us clues as to how we should interpret that bigger drama. Moving on from a reflection on matters of fact, then, I wish to consider these simulations as fictions, indeed as *fantasies*.[32] My purpose is not to indulge in fancy; rather, what I want to suggest is that the governmental power of these representations has less to do with their accuracy, more to do with their capacity to make us *want* to believe. Indeed, I will attempt to connect the particular *inaccuracies* of these simulations with particular desires, and so show how they engage us within a process of subjectification. In doing so I will consider three more–or-less sophisticated fantasies, speaking to four more or more-or-less sophisticated audiences, which seem to be nested within these simulation; the fantasies of organic solidarity, of harmless economic games, and of a technocratic sovereignty.

Simulated Solidarity

Let's begin with the least sophisticated. We can sympathise with the desire of those involved in commissioning, designing and ap-

proving new buildings to think that people will be able to escape from them alive. At this level MassMotion functions – like the familiar in-flight safety video – as a simple act of wish fulfillment. It visualises the conceit of the 2.5 minute rule, allowing us to *see* the calm that is produced by a well-regulated environment. The roll of these visualisations is, if for a more select audience, similar to those of pre-flight safety videos. For the concerned client, or the first time-flyer, both provide a means to steady the nerves. In satisfying this role inaccuracy is a positive boon, and doubting questions are best left ignored. When you have already placed your life in the hands of the pilot, is it productive to ask what parent would fit their own mask before that of a gasping child? Or to ask that, when we ditch in the mid-Atlantic, with no real hope of rescue, does it actually matter if I take off my high-heeled shoes? Can I really be expected, before leaping into the freezing water (the plane always lands on water) that will kill me within three minutes, that I *not* test my life-vest?

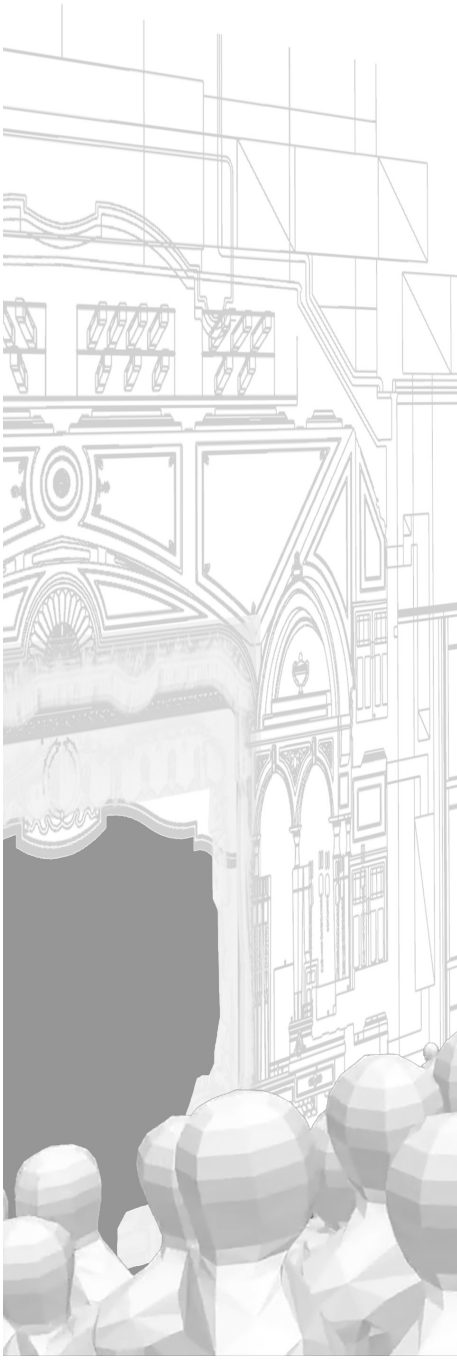
The well-worn irony recognised as the aesthetic hallmark of those videos suggests, no.[33] Indeed, these videos are a perfect example of Beck's 'homeopathic irony'. When the British comedian Vic Reeves reads announced your emergency evacuation instructions, Virgin Atlantic are asking you to worry, but not *too* much[34]. Rather, as Slavoj Zizek has suggested, the purpose of these videos is rather to gentrify catastrophe, which they do by allowing us to indulge "in the fantasy of society as an organic whole kept together by forces of solidarity and cooperation".[35] The simulations offered by MassMotion seem to indulge this same fantasy. Watching them calls to mind all those aspects of occupant behaviour that they *don't* represent; non-reaction, panic, crushing, ineffective attempts to fight the fire, doomed missions to return and save loved-ones. These behaviours would be difficult to model or predict, and would raise difficult questions for designers and regulators. The function of this first fantastical dimension, then, would seem to be to elides and equivocates these two difficulties; its is as if, when watching these simulations we are agreeing that any form of human behaviour that cannot be readily simulated by pre-programmed avatars is also not 'reasonable'.

Harmless Game

This simple fantasy, though, seems part of a more sophisticated one, aimed perhaps more at the building occupants than its designers. It is hard not to notice the homology between the computational logics of MassMotion and those used to model financial markets. The Efficient Market Hypothesis - the investment theory through which stock trading is understood as an effective means to distribute scarce resources amongst mutually exclusive ends – is based on precisely the same set of assumptions. This mode of modelling assumes a total and instantaneous transparency of knowledge between the actors within a system, suggesting that the self-interested micro-economic decisions of individual investors aggregate to determine a 'fair-price' for commodities, to balance supply and demand, and ward against

catastrophic boom or bust – the celebrated 'invisible hand' of Adam Smith. The simulations of MassMotion, along with their associated fire-drills and occupant health and safety manuals, provide another point of contact within which a neoliberal governmentality asks us to recognise ourselves as 'homo economicus', finding within ourselves a rational self-governor. Yes, in the event of fire, this *is* how I will behave. And if we don't recognise ourselves in this way, we simply become a problem for the facilities manager.

We know that the Efficient Markets Hypothesis is not accurate because of the ability of speculators to 'game' the market. The possibility of profit within financial speculation emerges as a result of asymmetries of knowledge. Likewise, case-fires demonstrate that the forms of efficient escape modelled by MassMotion do not play out in reality. Nonetheless, the fantasy provides cover for another kind of 'game'. Beyond Arup, the other leader in the field of fire-safety evacuation modelling is The Walt Disney Company. Using technology developed from crowd simulation software used in their animated films, they have produced *SpirOps*, a system to simulate crowd egress (and queuing behaviour) in their theme parks.[36] That is, there is a direct technology transfer between the simulation of catastrophic crowd dynamics for the purposes of entertainment – in Walt Disney's movies – and their use in commercial and governmental initiatives. And there is something of a transfer in *logic*, too; what family-friendly fantasy movies and fire-egress simulation animations have in common is that everyone escapes *in the nick of time*. The 'game', in the latter, is the ability to diverge maximally from prescribed codes – leveraging as much design freedom, and as many cost-savings - while remaining nominally 'safe'. Fire-safety engineering offers that 'loose framework' which allows for a 'possibility of play' within building design, while seeming to 'regulate its environmental effects', by ensuring a 'principle of non-damage'. Winning this game is not about improvements in occupant safety – the simulation is a simulation - but about strengthening market dominance through the reflexive re-design of regulatory frameworks.



Technocratic Sovereignty

But the ways in which this 'harmless game' constructs a 'play' within our definition of safety is, I think, only part of a final level of fantasy at work in these simulations. To see it, we have to return to the assumptions that are black-boxed by MassMotion, and more importantly to the *magic* behind its 'magic numbers'. In every simulation conducted for every permutation of contractor's hoarding at New Street Station, the British National Anthem is playing in the background. The emotionless avatars calmly queuing to exit a burning groundscraper in the City are all humming *God Save the Queen*. If the designers of those buildings are clever, they have been able to slow down the tempo, through the deployment of sprinklers, smoke reservoirs, pressure differentials, the eradication of combustible materials, or enhanced occupant-training programmes. But to keep this show on the road, the band *must* keep playing. The original function of this piece of music was to snap us out of one trance, and

fig. 6.7
Representations of the Empire Palace 2
Mass Motion Egress Simulation: Still
Liam Ross and Max Ochel

OaSys MassMotion egress simulation of the Empire Palace Theatre auditorium. Still showing 'Agent Follow' camera setting, of escapee from upper circle lower fire-exit, level 3. Extract from associated design research project.

into another; to shift us from blithe ignorance to patriotic obedience. The simulations of MassMotion continue to act in the same way. That is, at a certain level, 2.5 minutes is not arbitrary science'; it *is* magic, it *is* sovereignty. If prescriptive travel-distance regulations governmentalised the space-time of this original decision, fire-safety engineering seems intent to resurrect its spirit. They do not exorcise the magic of this 'magic number', they animate it, become its channel, its medium. MassMotion transubstantiates the Great Lafayette's patriotic bandleader, and he is still mesmerizing[37].

Design-Research component

The author has conducted a parallel by-design analysis of the current prescriptive and performance-based egress standards and their relation to the Empire Palace Theatre. The auditorium of the building (now Edinburgh's Festival Theatre) was modeled, and compliance with egress analysed. The results are uncanny: the worst-case scenario for travel distance (seat furthest from nearest exit) is precisely 32m, the relevant maximum travel distance; a capacity audience is estimated to exit in 2 minutes 40 seconds (while regulations require 2:30, three-verse rendition of *God Save the Queen* varies from around 2:30 to 2:50 in duration). The author cannot comment as to whether this is a coincidence, or whether the assumed speed of occupant egress embedded within both forms of standardization are reverse-engineered to ensure this close relation to the original building and event.

(Endnotes)

1 See The Arup Journal, Issue 2, (2008), p. 42

2 The NIST reports suggested that loss of fire-insulation due to the aircraft impact was the reasons the resultant fire was able to topple the structure. This view – in terms of its impact on building standardization - effectively relegates the incident to the status of a 'black swan'. See Kristy D. Thompson, *Final Reports from the NIST World Trade Center Disaster Investigation*, NIST, 30 June 2011, https://www.nist.gov/engineering-laboratory/final-reports-nist-world-trade-center-disaster-investigation.

3 G. Flint et al., "Effect of Fire on Composite Long Span Truss Floor Systems", Journal of Constructional Steel Research 64, no. 4 (2006): 303–15,. and "WTC Ten Years on: Learning from the Unthinkable", New Civil Engineer; London, 7 September 2011.

4 Construction Week Online listed Arup Associates in its Top 5 global engineering consultancies, citing 92 office in 37 countries, with over 10,000 staff and a turnover in excess of $1bn.

5 This concept was the organizing theme behind the V&A's recent retrospective of the firms work, "Engineering the World: Ove Arup and the Philosophy of Total Design".

6 See "Post-modern engineering?" in Rem Koolhaas and Office for Metropolitan Architecture, Content (Köln: Taschen, 2004).

7 Dutta's essay appears in Governing by Design : Architecture, Economy, and Politics in the Twentieth Century / Aggregate ; Contributors, Daniel Abramson, Lucia Allais, Arindam Dutta, John Harwood, Timothy Hyde, Pamela Karimi, Jonathan Massey, Ijlal Muzaffar, Michael Osman, Meredith Tenhoor, Culture, Politics, and the Built Environment (Pittsburgh, Pa. : University of Pittsburgh Press, [2012], 2012).

8 Dutta refers to a 2004 paper, a 'Review of the Publicity Requirements for Planning Applications', commissioned and published by the Office of the Deputy Prime Minister, authored by Arups. The paper, Dutta notes, was intended to "determine if the current statutory requrements for publicizing applications for planning permissions, listed building and conservation area consent are effective and offer value for money".

9 From the 1667 reconstruction act, collated here as "Proclamation issued by King Charles II. to prohibit the rebuilding of Houses after the great Fire of London, without conforming to the general Regulations therein premised." in 'Appendix: Charters (Charles II) | British History Online', accessed 7 August 2018, https://www.british-history.ac.uk/no-series/new-history-london/pp845-849.

10 See Leo Hollis, The Phoenix: St. Paul's Cathedral And The Men Who Made Modern London (London: W&N, 2009).

11 Marcial Echenique and Andrew Saint, Cities for the New Millennium (Taylor & Francis, 2001). P. 159

12 Brannigan makes this argument in V. Brannigan, 'Fire Scenarios

Or Scenario Fires? Can Fire Safety Science Provide The Critical Inputs For Performance Based Fire Safety Analyses?', Fire Safety Science 6 (2000): 207–18, https://doi.org/10.3801/IAFSS.FSS.6-207.

13 Rasbach's curriculum is D. J. Rasbash, "A Modular Approach to the Subject of Fire Safety Engineering", Fire Safety Journal 3, no. 1 (1 November 1980): 31–40. Its adoption as the 'core' of any Fire Safety Engineerig programme is recommended in S. E. Magnusson et al., A Proposal for a Model Curriculum in Fire Safety Engineering, 25, no. 1 (1 July 1995): 1–88.

14 Dougal Drysdale, An Introduction to Fire Dynamics (John Wiley & Sons, 2011).

15 M. Law and P. Beever, 'Magic Numbers And Golden Rules', Fire Safety Science 4 (1994): 79–84.

16 Law and Beever. p. 80

17 Law and Beever. p. 78

18 The summary offered in this section draws upon Barbara's address at 40 Years of Fire Safety event at Edinburgh University in 1994: Prof Barbara Lane #ed40fire, 2014, https://www.youtube.com/watch?v=zH-44JZ1diO8&feature=youtube_gdata_player.

19 V. Brannigan, "Fire Scenarios Or Scenario Fires? Can Fire Safety Science Provide The Critical Inputs For Performance Based Fire Safety Analyses?", Fire Safety Science 6 (2000): 207–18.

20 "Oasys MassMotion & Birmingham New Street Station : OASYS : International Broadcast News", accessed 10 April 2017, http://www.4rfv.com/ZGN7H8ZXKN6U/oasys-massmotion-birmingham-new-street-station.htm.

21 His lecture "Managing Emergency Evacuation and Reponse" was presented at the BRE event *Cities in the Sky*, accessed 10 April 2017, https://www.bre.co.uk/eventdetails.jsp?id=6761.

22 See the editors introduction, "Standards and Standardization as a Social Scientific Problem" in Vaughan Higgins, Simon Kitto, and Wendy Larner, Calculating the Social: Standards and the Reconfiguration of Governing (Palgrave Macmillan, 2010) p. 1.

23 St Andrew's House Scottish Government, *Research to Support the Improvement of the Design Verification of Fire Engineered Solutions as Part of the Scottish Building Regulatory System*, Website Section, (2 November 2016), http://www.gov.scot/Topics/Built-Environment/Building/Building-standards/publications/pubresearch/researchfire/resfirdvfes.

24 "FOUR New Hospitals "Have NO Proper Fire Protection" | Daily Mail Online"", accessed 5 April 2017, http://www.dailymail.co.uk/news/article-3764579/If-fire-patients-wouldn-t-chance-hell-FOUR-new-hospitals-NO-proper-fire-protection-problem-47m-two-years-fix.html.

25 "Fire Safety Engineering - Creative with Compartments"", IFSEC Global, 11 August 2008, https://www.ifsecglobal.com/fire-safety-engineering-creative-with-compartments/.

26 Michel Foucault, The Birth of Biopolitics: Lectures at the Collège de France, 1978-1979: Lectures at the College De France, 1978-1979, trans. Mr Graham Burchell (New York: Palgrave Macmillan, 2010). p. 259

27 Foucault.p. 261. Foucault's own example of an environmental technology is US drug enforcement policy of the 70's, which recognizes that supply limitation and scarcity are exacerbating drug-related crime. Through the reduction of enforcement activity and the introduction of subsidized drugs for addict populations, a new "economic" balance is struck between police and drug users.

28 Pat O'Malley, Risk, Uncertainty and Government (Taylor & Francis, 2004).

29 John Maynard Keynes, A Treatise on Probability (Courier Corporation, 2004) p. 30.

30 "The motto of Liberalism is "Live Dangerously", that is to say, the individual is constantly exposed to danger, or rather, they are conditioned to experience their situation, their life, their present, and their future as containing danger." Foucault, The Birth of Biopolitics.p. 66

31 'Oasys Software - MassMotion: Crowd Simulation and Pedestrian Modelling Software', accessed 25 September 2017, http://www.oasys-software.com/products/engineering/massmotion.html.

32 It would be possible to describe the 2.5 minute rule in similar terms; it was 'fantastical' for the British Fire Prevention Committee to assert that people would remain calm, in the event of fire, if they were able to escape within the specified time. I use this lense here, though, because it seems to me that one of the things that is novel about Massmotion, as opposed to the 2.5 minute rule that it is based upon, is its particularly visual medium, that it will us to imagine – far more than any prescriptive standard – what it is like to escape from a burning building. This seems to me an important part of its rhetorical power.

33 Tanya Dua, "A Brief History of Cheeky In-Flight Safety Videos", Digiday, 27 May 2015, http://digiday.com/marketing/brief-history-cheeky-flight-safety-videos/.

34 'Safety Video Saturday - Virgin Atlantic - Economy Class & Beyond', accessed 11 December 2017, http://economyclassandbeyond.boardingarea.com/2010/09/11/safety-video-saturday-virgin-atlantic/.

35 Slavoj Žižek, Elizabeth Wright, and Edmond Leo Wright, The Žižek Reader (Oxford, UK; Malden, MA: Blackwell Publishers, 1999). P. 91

36 See Mei Ling Chu, "A Computational Framework for Egress Analysis with Realistic Human Behaviors", 2012, https://cife.stanford.edu/node/955.

37 My thanks to Hugo Evans for this final observation.

7. Conclusions

Summative reflections and postscript

7.1
Fire-space

We love to see a log fire burning in the fireplace…

We gather around fire, it brings us together socially, for warmth, for light, for safety, to cook. Our built fabric, from pre-history until today, is evidence of this, organised as it often is about the hearth. Indeed, even the risk of fire brings us together, prompting forms of social, legal and spatial agreement. That is, one of the things we have seen through this dissertation is the specific importance of fire for the formation of our cities, our legal frameworks, and our govern-mentalities; it has appeared, in different cultures, and at different times, as a common problem, a kind of 'obligatory passage point' for the networking of these different concerns.[1] But the significance of fire is not only utilitarian. Fire is an important character within the literature, myth and folklore of almost every human culture. It is a deity whose reach spreads from Japan to Greece, one of the four cardinal elements, a key player within our astrological destinies. Even if we don't claim – as some do - that fire is what makes us uniquely Human, we might agree that it is one of our first and most significant socio-technologies. [2]

It is due to this close interplay between the physical and psychic that Gaston Bachelard can propose a 'psychoanalysis of fire'. In his book of that name, the philosopher of science tells us that fire furnishes us with formative shared experiences, as a fascinating physical phenomenon, but also as the pretext to governmental prohibitions. An important fore-runner to the sociology of scientific knowledge, Bachelard suggest that to understand this phenomena we must recognise it as properly *social*. Fire is not something we can approach 'objectively'; we experience it as always-already wrapped up in networks of care and concern. A burn teaches the child less about the nature of fire, more about the legitimacy of their parent's prohibitions; "the natural experience comes only in second place to furnish a material proof which is *unexpected* and hence too obscure to establish an item of objective knowledge".[3]

Because of our shared experiences with it, he suggests that fire has a privileged explanatory power; it can be used to explain almost anything. One of the things it explains, for instance, is the connection between cleverness and disobedience. According to Bachelard, we have each developed something like a 'Prometheus Complex'; we have learned that to learn about some things we must become thieves, hiding (metaphorically or literally) behind our parent's backs. And fire is also sexualised, a thought-tool of Eros; when lonely farmers burn down their hay-barns, their self-inflicted arson acts out, but also ignites and spreads, unrequited rural ardours. But fire also supports a gentler form of reflection. The warmth offered by a log fire, he contends, is the primordial context for 'reverie'. Indeed, Bachelard tells us that fire lends to that form of thought a particular 'shape', one that distinguishes it from other patterns of thinking.

> The Dream proceeds on its way in a linear fashion, forgetting its original path as it hastens along. The reverie works in a star pattern. It returns to its centre to shoot out new beams. And, as it happens, the reverie in front of the fire, the gentle reverie that is conscious of its well-being, is among those which best hold fast to their object or, if one prefers, to their *pretext*.[4]

Think Fire with Fire

Bachelard's reflections on fire resonate with this study at a number of levels. In the stories told here, for instance, we have witnessed the difficulty of approaching fire 'objectively'. What we have not discovered, over the course of this dissertation, are a set of disinterested or impartial principles for fire-safe design, based upon the nature of that phenomena; rather what each of these city studies has shown is the historically and geographically specific nature of our fire-safety legislature. We have found ourselves approaching fire through existing networks of care and concern: When James I passed the Scotland Act, he approached the problem of fire through existing codes of moral responsibility; the British Fire Prevention Committee came at it through existing protocols for obedience; for the first Lagos Town Council, it was part and parcel of a project to displace indigenous modes of governance, and property ownership; for the Tokagawa Shogunate, it was an actor within the drama of sumptuary law, representing and reinforcing class hierarchy; for Arup, it was another load factor to be incorporated into 'Total Design'.

We have also seen how, even for the contemporary fire-scientist, fire somehow retains an 'unexpected' quality; the historically definitive fires are those that occur in reality, fires to which science and government necessarily arrive late. It is for this reason that fire-science is understood by its practitioners to be a 'forensic' science, capable of gleaning only retrospective insights, whose impartiality is always compromised by its role in the court of law.[5] And perhaps we have

also contributed something to a 'psychoanalysis' of fire. We discovered something Promethean in the work of Arup associates, and the advocates of performance-based regulators; for these actors, simulated fires, in laboratories or on computers, appeared as a means to 'steal' the legitimacy of fire, and so to circumvent existing frameworks of authority. And in the Scotland Act, through the connection it drew between 'common women' and house fires, we surely saw a legal codification of an association between fire and sexuality, through their mutual inflammatory potential.

But the reason that I draw on Bachelard to begin this summative reflection is to consider the way that fire might have given a distinctive shape to the 'reverie' presented here. At the outset of this project, fire was merely an expedient means to bracket the scope of this investigation, to define what it did *not* do. But at its close, it seems to me that fire has done much more than this, that it has provided the project with something like a 'centre'. It has been the organising problem from which we have 'shot out new beams', but also returned. This observation seems significant to me, in two different ways. The first is methodological. It strikes me that, when setting out this project, I had not yet recognised the importance of having such a material 'pretext', an organising problem that would shapes the characters of it 'solution'. That is, while writing the preceding chapters I do not think I gave fire its proper due, described its actancy as fully as I might, either physically, or psychically. I hope to address this, in some small measure, through this concluding reflection. The second reason, though, is more substantive. It strikes me that the pretext of fire has been analogously important for the processes of governmentalisation discussed here, also. That is, in each of these city studies, fire has provided an important organising pretext around which changes in governmental, legal and architectural policies have been gathered, have strayed, but have also returned. What I wish to do in this conclusion is to draw upon the explanatory power of fire as a means to describe the *shape* of this dissertation, but also of governmentality.

Spatiality of Fire

This is not a novel suggestion. Bachelard's bucolic fire-side reveries have themselves had a surprising explanatory power, particularly within Science and Technology Studies. Indeed, for sociologists John Law and Annemarie Mol, one of the many things that fire can explain is the *shape* of science. Law and Mol make this argument in "Situating Technoscience: an Inquiry into Spatialities", a paper which begins by arguing that the fundamental insight offered by STS has been to *spatialise* science:

> The process of tracking down 'science' in the laboratory rather than in theory not only implied that normative epistemology gave way to ethnographic realism. It also brought the sciences *down to earth*. No longer the result of being transcendental, science needed to be *localised*.[6]

To summarise their argument: What Latour and others have demonstrated is that facts are *local*. They make sense in relation to particular contexts. *Moving* them is hard work; if they are to keep making sense, they must bring with them those particular relationships within which they were first made. Hence the importance of the 'immutable mobile'; for science to spread, to form networks, these *relationships* must be held fast, at the same time as being *transposed*. By way of example, Law offers a ship, sailing from Lisbon to Calicut in the 15th century. Of course, it is important that bulwarks, spars, sails and wind are kept in the proper configuration; but if that ship is also to act as a delegate for Portuguese Imperialism, it must carry with it, and recreate at its destination, a broader network of relationships, transposed from Lisbon. The basic analytic move of Actor Network Theory is here described through the superposition of two spatial metaphors; that of the *region* (the field of relationships that are held stable) and of the *network* (the trajectories through which those relationships are translated).

But for Law and Mol, Portugal is never rebuilt in India, nor is it ever consistent with itself; networks change as they move, and as we move within them, such that we never really find something like an 'immutable mobiles'; science operates through actants that are mutable and immutable, mobile and immobile, in every possible configuration.[7] In search of alternative metaphors for the way science works these authors look to Bachelard's 'star pattern'. Science, they suggest, is like fire. We cannot identify within it any particular or consistent rationale, any coherent set of practices. But nonetheless, it retains a certain constancy of 'shape'. That shape, they suggest, is defined by a kind of continuous flickering exchange, one in which rationalities and materialities, 'facts' and 'artefacts', constantly supplant one-another. That process of exchange is unstable; 'artefacts' make sense only in relation to the 'facts' that they themselves sublimate and replace. But nonetheless, that process does hold fast to a certain 'pretext', which they conceive of as being precisely that process of flickering substitution:

> Three attributes: continuity as an effect of discontinuity; continuity as the presence and the absence of Otherness; and continuity as an effect of a star-like pattern in this simultaneous absence and presence: this is what we imagine as the attributes of shape constancy in the topology of fire.[8]

To exemplify that metaphor, Law and Mol offer the following formula: $G = (V \times L) / W$. This particular equation was developed by American aircraft designer's in the 1950's. It was used to regulate the design of airplane wings, expressing a standard for maximum permissible turbulence (G, or 'Gust Response'). Like any algebraic equation, it gives presence to a set of absences; V is the velocity at which the plane flies, L is the 'Lift Slope' of the wing, and W is the Wind Load. By formalising these relationships, this equation allowed design calculation to replace physical testing. What Law and Mol draw our attention to is the fact that - as with any stan-

dard - those abstractions make sense by invoking prior presences; the expression 'G' represents and replaces the experience of brave or unfortunate pilots who agreed to test planes with a variety of wing types, flying very low (where W is greater), and at very high velocity (so as to generate more turbulence), until they were sick, blacked out, or their aircraft disintegrated.

> Look at it. *Present* is a figure of tolerable G. It is there, on the paper. But that figure depends precisely upon what is *absent* - a sickened and frightened pilot. *Depends* upon that which is absent (so it is present) but (in an additional twist) at the same time depends upon *making* it absent: because there is certainly no room for a pilot and his vomit in the network of relations pencilled on a sheet of paper by an aerodynamicist in a clean office. G in the expression achieves its significance because of that flickering between two impossible alternatives: that the pilot is absent; and that the pilot is present.[9]

The spatiality of science is, say Law and Mol, a 'fire-space'; it is a flickering here-and-there between a disintegrating plane and a clean office. It is in flickers like these that science spreads, changes, but also retains a kind of 'shape-constancy'. Science reproduces ways of thinking and ways of doing through constant substitutions between the rational and the material, substitutions that are constitutively unstable. That is, Science can never lead to a single episteme, a coherent set of practices, because it replaces the circumstances within which those ways of thinking and acting made sense. Nonetheless, technoscientific cultures might be said to be 'centred', inasmuch as they organise themselves around that flickering exchange, attempting to enrol our constantly changing understanding of 'things' (of the 'non-human') within diverse and overlapping concerns and interests.

Regulatory-Space / Fire-Space

I take the time to outline Law and Mol's metaphor of 'fire-space' because I think that, over the course of this dissertation, we have been exploring that metaphor literally. Their term resonates, of course, with the subject matter at hand; we have here been studying the physical spaces, and the 'regulatory spaces', produced by actual fires. But I think that what we have discovered within those spaces is also shaped in a way that resonates with Bachelard, Law and Mol's argument. We have not found, in fire-safety regulation, the emergence of overarching principles of fire-safety, or a coherent set of governmental practices, but rather a constancy of change. And that change has occurred through a process of constant substitutions, a kind of flickering exchange, between governing rationalities and their attendant technologies. The path described by that change

has often 'shot out new beams', been captured and re-directed by diverse interests. Indeed, there have been times in which it has undermined itself; the govern-mentalities described here have often replaced the conditions in which they originally made sense. Nonetheless, throughout that process, we have seen a diverse group of interested stakeholders - government, lawyers, building designers, contractors, manufacturers, occupants, the public – being gathered together, held-fast in collaboration, by the recognition of a common problem, that of fire-safety.

My purpose in this conclusion is not to summarise the findings of this dissertation in the terms used to date. Rather, what I aim to do here is to re-frame that material through a new organising metaphor. My purpose in doing so is to nuance its object of study, and to define a revised trajectory of future research. That is, what I wish to recognise is that, if the original ambition of this dissertation was to explore the shaping effect of building standards on processes of governmentalisation, what has been discovered has something specific to do with fire. I mean to appropriate Law and Mol's term to define that revised object of study. By 'Fire-space' I here mean the sum total of those exchanges between the discursive and the material – those networks constructed between government, architecture, law, and the built environment - that are prompted by the problem of fire. This seems, in retrospect, the descriptive ambition to which this dissertation has attempted to hold fast. In the remainder of this concluding reflection, I want to summarise the key findings of the dissertation, concretising Law and Mol's metaphor. I do this first through the motif of a flickering flame. This motif, I suggest, helps us to identify the significant moments of drama within each of the stories told here. Each of the city case studies presented can be seen to hinge around moments of substitution through which govern-mentalities are materialised, and so become subject to re-appropriation. It seems to me that it is in those moments of flickering substitution that we see most clearly the shaping effect of building standardisation on our govern-mentalities.

From Grand Dieu to Ying Yang

Our first story began with a fire that broke out in a theatre in Edinburgh, and a conductor that played a tune. That tune had originally been written down by a magazine editor in London who - responding to the exigency of a Scottish rebellion - sought to use it to enrol the English regions in displays of patriotic obedience. But once established, that obedience proved itself useful in other ways; years later, in a pacified Edinburgh, it struck up an uncanny relationship with the geometry of a particular building, and so became enrolled in the drama of public safety. Because the song and the building were the same *length*, they were able to form a network, one that was strong enough to support the construction of new regulatory frameworks, the first geometric limitations on plan depth. Those frameworks were thought to provide a reified form of obedience,

through the delegate of building design. In Scotland, they came to be reconstituted in the form of door widths, corridor lengths, and plan geometries. But as the experience of war and fire waned, so did the sense of those frameworks. Indeed, their insufficiency suggested the need for further networks of social governance – mechanisms for building management and occupant training – so as to offer something like a facsimile of the original obedience, even if it did generate counterproductive effects. Nonetheless, between these social and architectural frameworks, equations have been generated to facilitate a trade-off between the real and reified forms of obedience: a zero-tolerance approach to staff management can be used to buy design 'freedom'. And while all this is going on, collateral effects are generated. For instance, travel distance codes can be shown to carry within them accidental architectures of tacit way-finding. And in some contexts, their adherence carry's a surplus, symbolic value. In Tianjin, where such standards are not mandatory, their application becomes a means to demonstrate openness to the 'West', or at least to international exchange. That symbolic value is offered imaginary reinforcement by the fact that those same standards can be used to create a visual metaphor for the happy relationship between communism and capitalism. As such fire-safety becomes another factor within the 'win-win' mentality of contemporary China, and is globalised along new vectors, carried by glossy renders of the world's tallest skyscrapers.

From Slum Clearance to Passive Ventilation

In Lagos a spark flew from a pistol, setting light to a thatched roof. The distance that that spark flew was translated into a formula, defining an area of fire-safety setback. What that spark meant originally was the presence of an indigenous armed militia. And what that distance meant originally was a legal rationale for Sovereign cession, in the form of 'slum clearance'. But as it rationalised and technologized that Right, it also tied it to other concerns, initially those of enforced colonial dependence. For later generations of planners, though, its meaning would change; the space cleared by that spark would offer a means to prevent the spread of disease, or to create a distant image of Welwyn Garden City, or to ensure universal passive ventilation. In parallel, on the ground, that same standard would make room for a wide range of uses – for Mosques, for the homeless, for the shadow labour that makes life liveable for poorly paid policemen – whose marginality it accommodates, but perhaps also reinforces. The incompatibility of those two rationalities seems not to trouble anyone, indeed it suggests its own *realpolitik*, at least until a major fire occurs. Until then, that space will continue to offer what seems like an open potential for all manner of future uses, a potential that might only be concretised through another abstraction, that of the 'public good'.

From Ramparts to Towers

In Edo, the houses of the urban poor burned down, and burned down, and burned down again, until they brought with them the castle of their Shogun. But by being burned down, that castle found a way to extend itself, to become bigger and stronger. Always a physical mechanism for capital concentration and generalized impoverishment, its govern-mentality was now translated into the domain of city planning. Through sumptuary law, fire-risk became encoded within more wide-spread and formalised mechanisms designed to limit capital accumulation. But in the long term, that strategy back-fired. At the same time as expanding his authority, the shogun found himself giving ground – quite literally - to an emergent merchant class. That is, the need for and the growth of that class in Edo emerged through, and was limited by, specific materio-semiotic conditions; the merchants could be build their 'castle' only where the laws of property and land could be brought into relationship by the dense mud of fire-proof construction, and only on the margins – economically and spatially – of an economy that was still based on the continuous consumption of buildings. And despite being rebuilt dozens of times, a spectre of Edo's feudalism continues to hang over contemporary Tokyo; salarymen still labour their entire lives to pay off a ground-rent whose value is determined by the constructed pyro-seismic risk of a dispose-able building stock. Despite many attempts to change this state of affairs, it seems to be sustained by a distant abstraction; 'the West'. The conjoined spectre of that Other, and of the 'Big One', conspire to frighten an economy into its continued habituation with loss. This vicious circle only seems to be broken at its point of greatest intensity; when concrete high-rise buildings become simply too expensive to demolish.

From 9/11 to the Heron Tower

American Airlines Flight 11 and United Airlines Flight 175 collide with the twin towers of the World Trade Centre, in New York. They carry with them a mass of combustible materials, unanticipated by existing building regulations, and leave a three-storey hole in the building's fabric, stripping its structure of fire-proof cladding. The question as to which of these reasons caused the building's collapse will decide whether this event should be anticipated by future building regulations. The high political and economic cost of this event supports a series of detailed post-fire analyses, ones that in turn validate new modes of computational modelling for fire dynamics. One of those analyses will attribute the building's collapse to a loss of fire-proof cladding, arguing that buildings should be designed to retain structural integrity without such cladding. This argument, and those modes of modelling, have the effect of normalising aspects of the World Trade Centre crash; they are used to gain regulatory approval for buildings that are designed with three-storey voids within them, and that omit the use of fire-proof cladding. Those new modes of modelling are developed in the UK, in London; they

translate the credibility offered by 9/11 to a new regulatory context, where they are used to critique prescriptive standards for fire-safety. One of the rules they are used to critique is based on the original fire considered here, the Edinburgh theatre fire. But to replace that fire, these modes of modelling also *depend* upon it; they translate its assumptions into avatars, simulated humans that are more reliably obedient. If those avatars hope to concretise the abstractions of those previous formula, they do the opposite, secreting them even deeper within our built fabric. Nonetheless, those simulations are convincing for certain audiences, and offer another means of translation; they allow the equation of heterogenous technologies – ceiling heights, sprinklers, pressure differentials, levels of combustibility, and management programmes. In doing so, they support the design of buildings, of a wide variety of shapes, all over the world. At the same time – for Arup Associates and the City of London Corporation – the capacity and rhetoric of design flexibility provides a means to consolidate specific forms of commercial consultancy, and specific forms of governmental regulation, in a specific place.

Star Patterns of Standardisation

Of course, uncontrolled fires burning through cities across the world, over time, are quite distinct from a log fire burning in its fire-place. Likewise the pragmatic realities and agonistic struggles of urban governance and building design are quite distinct from the self-conscious comfort of philosophical reverie. Nonetheless, what I sought to do in the above summary was to describe a shape-constancy between all four. The process of fire-safety standardisation entails something of a fire-like 'flicker'. That flicker occurs because building standardisation is a two-part process; one of abstraction and of concretisation: As we set out in the pre-amble; the act of *legislating* is the process of abstracting standards from existing buildings and the events that occur within them; the act of *regulating* is the process of concretising those abstractions in the form of new buildings. What we can add here is that, in the oscillation between those two processes, buildings and govern-mentalities substitute one-another, change, spread.

To continue the metaphor; let us try to arrest that process, to consider the relationship between our building standards and the built environment they point toward. Even in this circumstance, I want to suggest, we see a kind of impossible simultaneity of absence and presence. That is, as we have seen, building standards often seem to have arrived *too soon*; their rationalities read like utopian ambitions, completely out of touch with the everyday reality of building practices (recall Marianne Valverde, walking around Toronto, reflecting on the realities of 'Euclidean' zoning). Indeed – if we follow Law and Mol – we could say that this is precisely why they make sense; it is only on account of their contrast to the existing state of affairs that those standards might hope to organise action. But those same standards can also seem to have arrived *too late*; as soon

as they succeed, they supplant their sense of necessity, appearing out-dated, tying building practices up with the problems of the past (recall the advocates of performance-based standardisation, whose arguments depended upon the prescriptive infrastructure they sought to replace). That is, one of the things we see, in the flickers of standardisation, is that our legal utopias and built realities are constitutively out-of-joint. If we could imagine a legal framework, that was fully embodied by the built environment, at the same time as making sense to all those who worked with it, it would appear immediately superfluous. And if standardisation changes like fire, it also spreads. The purpose of abstracting concrete characteristics of one building is to reproduce them, to make them move. A part of one building in Edinburgh is reproduced through another part of another building in Tianjin. And this process of moving buildings entails a translation. That is, what we have not seen through the stories recounted here is the emergence of a universal sameness, at either the material or the rational level. Rather, standardisation has seemed to occur through a kind of concatenation of contingencies; old utopias are supplanted by new ones, ones that colonise the redundant infrastructure of solved or forgotten problems.

So far, so dream-like. That is, perhaps we could characterise the stories told in this dissertation as nothing but a 'cumulative mess-trajectories', a process of rationalisation that has forgot its original path as it hastens along? My purpose here is to suggest otherwise. I draw on the metaphor of fire to suggest that the process of fire-safety standardisation does have something of a 'centre'. I want to suggest that this occurs, or becomes visible, because fire-safety is a problem that *keeps happening*. It is a problem that re-occurs every time we have a fire, and every time we try to design a safe building. Both of those circumstances prompt reflection as to the effectiveness and suitability of our governmental frameworks, and their attendant technologies. That is, fire is a problem that creates its own really-existing moments of 'Infrastructure Inversion'; moments in which our facilitating built environment suddenly turns against us, and when the forms of social agreement that it sublimates stand out in sharp relief. Of course, the most significant of these occur when major fires break out; such events often provide the prompt through which existing rationalities get re-rationalised. But in a more minor way, something similar occurs every time an architect interprets an article of fire-safety legislation. In these moments, existing rationalities are re-materialised, as designers seek to achieve the same end with different means.

What I do not wish to suggest here is that this dissertation has been centred by fire itself; the actors described here have not all been staring into a fire, reflecting on the nature of what they are looking at. There has been not one, but many 'pretexts'. For Pelli Clarke Pelli the pretext was to construct an iconic building; for the Lagos State Secretariat, it was to maintain its capacity to seize land; for the Tokagawa Shogunate, to ensure the impoverishment of its subjects; or for Arup Associate, the construction of competitive advantage.

The 'centre' of this dissertation has been the problem of fire-safety; this has been the common concern through which the interests of those actors discussed have been forced into collaboration. Or to put this in other terms; fire-safety has been the exemplary 'boundary object' of this research project; it has been that ill-formed problem which has allowed a variety of actors to gather, competing to shape it through their individual concerns.

Governing by Accident

For Law and Mol the concept of 'fire-space' contributes to an ambition to 'situate' science. They find the metaphor of fire helpful in describing how the globalising trajectory of technoscience is nonetheless always a relationship of 'localities'. Thinking science through fire helps understand the way it moves, at the same time as keeping it 'down to earth'. That ambition resonates with others we introduced through the work of governmentality scholars. In the introductory section of this dissertation I used Foucault's paraphrasing of Rokpe to describe governmentality as a process of "shifting the centre of gravity of governmental action downward".[10] That is, for Foucault that term denotes a shift, in reflections both in and of government, away from the question of sovereign Right, toward an increasing practical imbrication with the health, safety and welfare of the population. The second way that I wish to use Law and Mol's term here is to suggest that our study of fire-safety standardisation contributes to an ambition to 'situate' governmentality.

Reviewing the stories told here, I think it is possible to see within them a comparable movement, one of 'bringing government down to earth'. For instance, when *The Gentlemen Magazine* published "God Save The King", it did so as a direct assertion of the sovereignty of George II, a call for obedience in the face of the Jacobite uprising. However, by enrolling the obedience elicited by this tune in further governmental networks, fire-safety became a means through which that authority claim came to be re-cycled, through rational and technological mediation. That claim became enmeshed within a set of highly contingent relationships between particular personalities, fires, buildings, standards, and simulations, and as such was shaped by and advanced the interests of a wide range of other interest groups. The reduction of Lagos by HMS Bloodhound and Teaser, and the resultant cession of that city by the British Crown, were simple acts of sovereign violence. But the fire-safety standards that British settlers then imposed upon the city began to governmentalize that authority claim, opening it up to rational critique and practical re-direction. Those regulatory mechanisms came to be claimed by diverse interests and concerns, and their material carriers appropriated by other users. Their current status, and future value, lie in the hands of those who would seek to define concepts of the 'public', and those who would choose to live in their shadow. The sumptuary laws of Edo, which denied the urban poor access to widely available means of fire-safe construction, were also explicit means

to enrol buildings, and fire, within the maintenance and representation class privilege. But the effects and side-effects of those laws, as they went on to shape the city, became the mechanism through which the ruling class had to give ground, physically and legally, to an emergent merchant class.

For scholars of Governmentality Studies, and Science and Technology Studies, the ambition to bring political and scientific discourse 'down' to the level of its socio-technical networks is critical and self-conscious. That has not necessarily been the case for those actors discussed here. What we set out to study were processes of historical change that occurred as the net result of dispersed and often divergent authority claims; the kinds of transformation that for Ulrich Beck occur via the 'back stairs' of side-effects. That is, we have been studying changes in govern-mentality that occur by *accident*. The etymology of the noun 'accident' likewise describes a downward trajectory; its root is the Latin *cadere*, "to fall". So; what is it that we have discovered, tripping down those stairs, and finding ourselves - perhaps against our will - being 'down to earth'? How might such an ignominious trip have helped to 'situate' governmentality? We began to reflect on these question in Part 3, where we noted two distinct but related meanings of the term 'accident'. We saw that, on the one hand, that term denotes those things that happen in unexpected or unforeseen ways, usually misfortunes or mishaps; a ship strikes a reef and is sunk, a person leans from a window and falls out, a botched trick kills the magician, a bomb explodes unexpectedly, a cook-pot is knocked over and burns down the city, a passenger plane is hijacked and flown into a skyscraper. But at the same time, we saw that the term also means something else; a property or quality of an object that is considered inessential, coincidental, contingent; the yellowish patches that Freud found on the Venus of Milo, a corridor that happened to be the same length as a piece of music, the unintended symbolism of a travel-distance diagram, the environmental benefits of a suburban city form, the non-combustibility of high-rise structural systems, the aesthetic currency of removing fire-proof cladding. The thing that has come up at us from the foot of these stairs, the other flicker we have seen in each of these stories, has been the intersection of these two kinds of accident. That is, the networks of standardisation described here have been formed by accident in two ways; their object cause has been some unfortunate event, and their means of mediation has been the chance intersection, through common techniques and practices, of diverse interests. We know that, for Foucault, governmentality is construed as an ambition, within the conscious exercise of authority, to operate on and through the self-governing capacities of the subject; it is the construction of an 'accidental' intersection of interest between the governor and the governed. What I have tried to show through this reflection on building standardisation, drawing on terminology from Science and Technology Studies, is the degree to which that process is prompted by, and mediated through, accidental intersections with non-human actants.

Trial by Fire

I would like to conclude this reflection by extending our exploration of accident one step further. I am prompted to do so by the fact that what we have here called 'accident' relates closely to what, in more bald terms, Latour himself would call 'reality'. What Latour does not mean by this term is a transcendental 'truth' or external 'nature', dimly visible to us from within our cave; by reality he means only the sum total of agreements, those networks of human and non-human cooperation, that we find ourselves immersed within, and labour to construct. So broad a term might be of little use, except that the etymology of the terms helps us to understand how we *experience* those networks. Echoing observations familiar from both Heidegger, and scholars of Infrastructure Studies, Latour suggests that our socio-technical networks only get thematised when they *resist* (*Res*, the Latin for 'thing', is the root of both 'real' and 'resist').[11] Or to put that another way; 'objects', and so 'objectivity', only really become visible appear when they *object*, when some recalcitrant actant frustrates our own attempts to subjectify, to govern.[12] As such, Latour suggests that the concept of 'reality' should always be thought of as synonymous with that of 'surprise'.[13]

If this dissertation has hinged around accidents, moments of 'infrastructure inversion', these have likewise been moments of surprise; moments in which the built environment has exerted some form of resistance in the face of our attempts to govern it. And I make this minor change in terminology because, for Latour, moments of surprise are important in a way we have not yet discussed. Unforeseen accidents, unexpected overlaps of interest; these are moments in which our existing socio-technical networks either fail or are made stronger. Moments of surprise in which people or things behave unexpectedly, pose a kind of 'trial of strength' for existing rationalities, they offer a kind of 'reality test', revealing new fault-lines, or powers of consolidation, between the human and the non-human.[14] I draw on this Latourian terminology, then, because I think it helps us to describe in more detail the distinctive challenges and opportunities offered to government through the problem of fire-safety; that is, I want to suggest that certain accidental qualities of fire present us with a particular kind of 'trial'.

Major urban conflagrations are dramatic events which register within the public consciousness. They rise above the *noise* of the everyday, and as such they are readily enrolled in agonistic struggles.[15] But what is more – perhaps more so than for other governmental problems, such as safety in general, or accessibility, environmental standards, policing, or public health – fires happen to remove some things that would otherwise be obstacles to change; they damage or destroy our buildings and cities, those obdurate remainders and reminders of prior govern-mentalities. We are familiar with the way that fire creates associations between destruction and re-birth; this is explained by the mythological figure of the Phoenix. But trans-

lating that story into socio-technical terms, we could say that fire is an effective prompt for change because it removes some of the cost barriers that would otherwise resist change. It rights-off those material costs, invested in our building stock, that are physically destroyed by fires, but it also destroys the reputational investments that are their twin. Fires don't just destroy buildings, they also discredit those who designed them, those who supplied the materials to build them, those who paid for them, those who warranted them as safe. Fires destroy *credibility*, dismantling relationships between the material and the rational, so creating the circumstance in which both might be re-imagined.[16]

But it is easy to underestimate the resistance to such change. Sometimes it can appear less costly to rebuild a whole city, time and time again, rather than change the way that we think. This is because the forms of agreement and investment that are mediated by our built environment, by way of our building standards, are so wide and distributed. I make this point to conclude on because it seems to me to be at the root of the frustration that many architects feel, when faced with governmental regulations. It is difficult to know how to participate meaningfully when faced with networks of agreement that are so broad, so dispersed, and so written into the woodwork. Apathy, hubris, and irony are logical means of self-preservation, just as Sovereignty is a comforting fantasy. Nonetheless, what I have tried to offer within this dissertation are some examples where architectural concerns – even if by accident - *do* come to have some shaping effects on government. I have tried to show this in the way that, by working around existing window-cleaning standards, architects have contributed to the construction of new, extra-governmental forms of agreement in Edinburgh; through the way that, in the shape of a building in Tianjin, they have contributed to the globalisation of particular forms of fire-safety thinking; that by finding ways to work within the shadow of the set-back code, or to redefine it as a means of ensuring passive ventilation, both architects and regulators in Lagos have found ways to re-cycle the space of sovereign cession; that by working with concrete, in high rise construction, Tokyo's architects, engineers and developers are contributing to a change in political-economy; and that by celebrating the use of exposed structural steel, and creating markets for sky-lobbies, the architects and engineers at Arup's have advanced particular changes within the UK's regulatory frameworks.

It has not been my purpose to ascribe a moral value to those changes, only to note that architects are well situated to facilitate them. In the ordinary course of practice, Architects don't usually define the problems of government. They are the local technicians, within the field of building design, tasked with translating between the rational and the material. And as such, architecture most obvious role is in consolidating govern-mentalities. By declaring an *arch*é, building designs selectively broadcast particular govern-mentalities, raising them above the noise of others. And by resolving the competing demands of those other interests, defining their material intersection,

architects translate them into durable form. This process, one of material and reputational investment, is the process of constructing the 'reality' of particular ways of thinking. But what I have sought to show here is that realisation is also a test, a moment in which fault lines emerge. By materialising governmental problems, buildings also establish trajectories of change, shaping new problem and opportunities. It is in this space that I have suggested that we find the particular actancy of architecture. Building design is caught up in a complex and widespread governmental framework, but individual buildings have the capacity to exceed the contingency of that situation. Indeed, what I have tried to show is that they have that capacity through, not in spite of, their standardisation. Building standards are a a point of contact, an interface, through which the singularity of building has a capacity to construct pervasive change.

fig. 7.1
'IT WAS MURDER'

Frontpage headline, *The Sun* Newspaper, June 17th 2017

7.2
Reality Test Grenfell

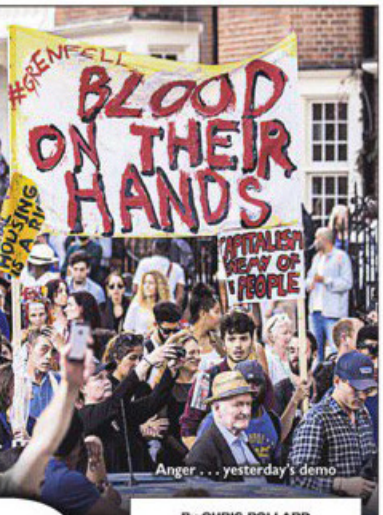
THE Sun
Saturday, June 17, 2017 FOR A GREATER BRITAIN 70p thesun.co.uk

CROWD MARCHES ON DOWNING ST

Protesters rage at tower deaths..

IT WAS MURDER

Inferno . . . at tower



Anger . . . yesterday's demo

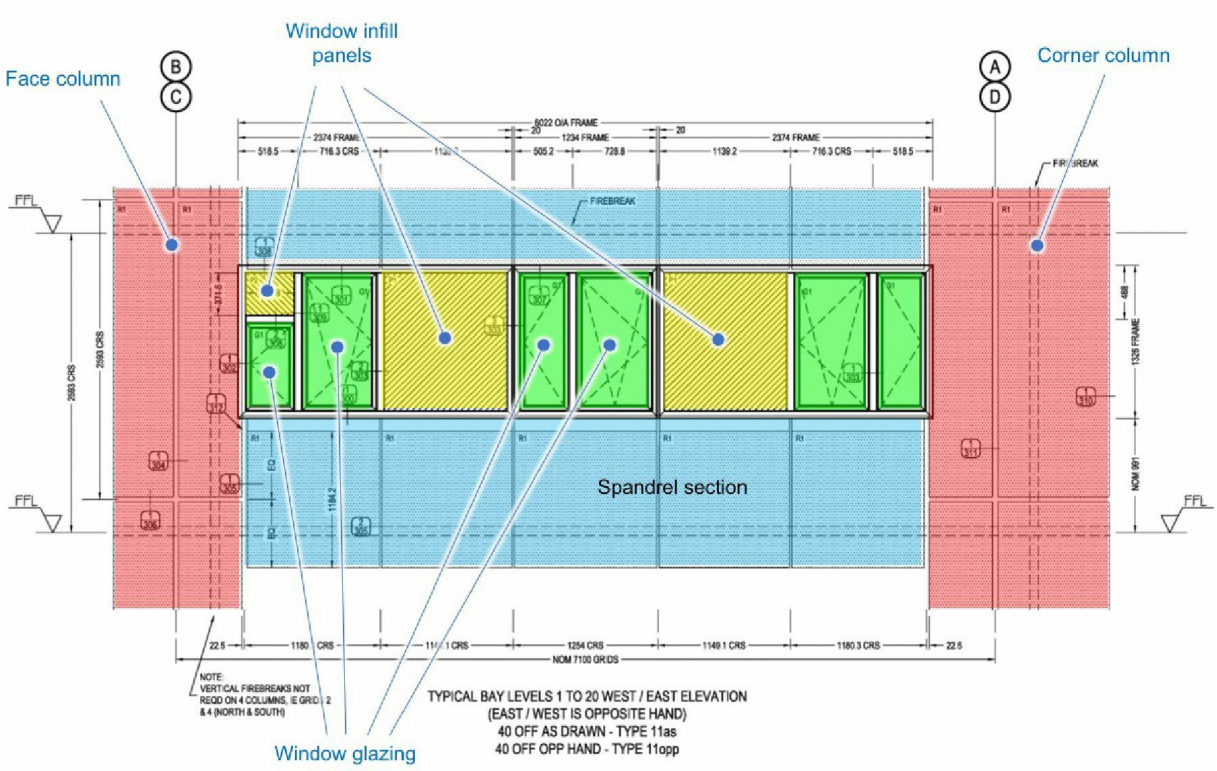
By CHRIS POLLARD and LYNN DAVIDSON

HUNDREDS of protesters marched on Downing Street last night as public anger over the Grenfell Tower inferno intensified.

Crowds shouted "Murderers" and "Blood on your hands" as demos took place in Kensington and Whitehall — hours after the confirmed death toll rose to 30.

Prime Minister Theresa May had earlier been forced to flee a local recovery centre under heavy police guard as residents rounded

Continued on Page Three


Face column
Window infill panels
Corner column
Spandrel section
Window glazing
TYPICAL BAY LEVELS 1 TO 20 WEST / EAST ELEVATION
(EAST / WEST IS OPPOSITE HAND)
40 OFF AS DRAWN - TYPE 11as
40 OFF OPP HAND - TYPE 11opp

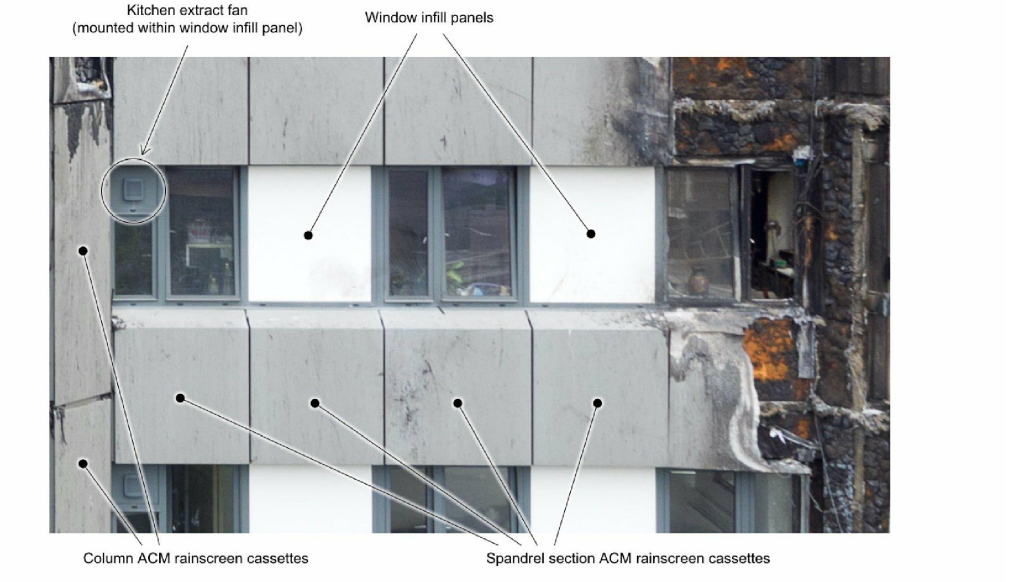

Kitchen extract fan
(mounted within window infill panel)
Window infill panels
Column ACM rainscreen cassettes
Spandrel section ACM rainscreen cassettes

fig. 7.2
Typical Building Terminology used within this Report
Figures 8 and 9, Bisby, Luke. 'Professor Luke Bisby's Expert Report'. Grenfell Tower Inquiry, 2018. Source: www.grenfelltowerinquiry.org.uk

> I am confident that the fire started in the Kitchen of Flat 16 (Level 4), in the area near the window. The fire most likely spread to the cladding via gaps or holes which formed in the polymeric window framing boards that surround the kitchen window, and also through the weatherproofing membrane and thermal insulation, all of which were installed during the 2012-2016 refurbishment. The fire most likely then penetrated into the back of the cladding cavity and ignited the polyethylene filler material within the aluminium composite material (ACM) rainscreen cladding cassettes that form the majority of the building's exterior surface. The fire appears to have spread to the cladding, and started escalating up the East Face of Grenfell Tower, before the first fire service personnel entered the kitchen of Flat 16 and attempted to extinguish the fire within the building. The primary cause of rapid external fire spread was the presence of polyethylene filled ACM rainscreen cassettes in the buildings refurbishment cladding system. Other factors that may also have contributed to the fire's spread include: the use of combustible products in the cladding system; the presence of extensive cavities and vertical channels within the cladding system; and the use of combustible insulation products within the window framing assemblies.[17]

The Grenfell Tower fire occurred on the 14th June 2017, consuming a block of public housing in the Royal Borough of Kensington and Chelsea, West London. It caused 72 deaths, and 70 injuries. The victims were disproportionately from ethic minority communities. This high death toll has been attributed – as above - to the rapid spread of the fire, which occurred externally, and at height, through a recently installed cladding system. That cladding system had recently been installed, designed to improve the energy performance, and attractiveness, of the tower.

That fire, occurring at the end of this research project, raised to public consciousness some of the academic reflections pursued in this dissertation. Since Grenfell, the politics of building standards, especially fire-safety standards, have been the subject of headline news and party politics in the UK. Indeed, with Bachelard still in mind, we could use the political and media response to this event as an example of how difficult it is to approach fire 'objectively'. The event has been portrayed in a wide variety of ways, appearing as evidence of "the disastrous effects of austerity", "the terrible consequence of de-regulation", and the governments "disregard for working class communities".[18] It has been portrayed variously as an 'indictment of green-wash', an opportunity for the left to stir up 'mob-mentality', an example of 'institutionalised racism', or more

simply as 'murder' [fig. 7.1].[19] The onerous programme of the official public inquiry testifies to the difficulty of achieving an impartial review of the facts; the first six months have been dedicated to hearing accounts of the event; two weeks of commemoration hearings for the 72 victims, and six weeks of first-hand accounts from firefighters and survivors, prior to reports by expert witnesses. Understanding this event demands hearing from it from all sides, and the process of reflecting on what lessons might be learned is expected to take at least 18 months. [20]

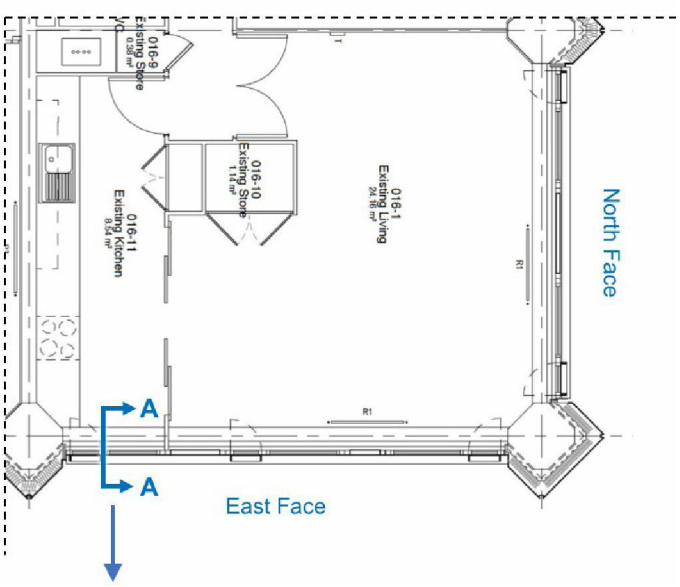
fig. 7.3
SEA00000229: Typical window section, Grenfell Tower refurbishment
Figure 14. Bisby, Luke. 'Professor Luke Bisby's Expert Report'. Grenfell Tower Inquiry, 2018. Source: www.grenfelltowerinquiry.org.uk

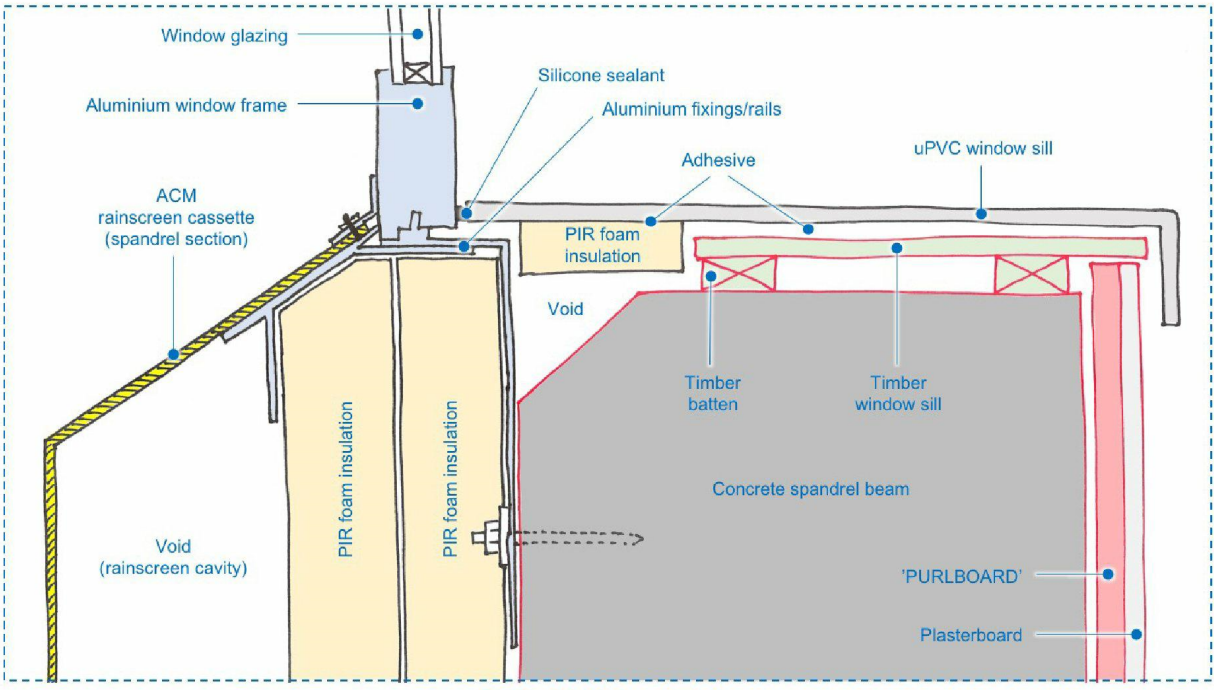
Design drawing for the Grenfell Tower refurbishment, showing the location of timber infill material, PIR foam insulation, uPVC, adhesives, and ACM cladding panels. Reproduced and annotated in Luke Bisby's report. Plan identifies location of section in relation to the kitchen, flat 16, Grenfell Tower.

With that enquiry ongoing I cannot offer to speak here about the effects, let alone the side-effects, of Grenfell; the way it shapes future legal and architectural structures within the UK is yet to be determined. That is, this event does not seem amenable to the approach I have taken elsewhere in this dissertation. Nevertheless, occurring at the close of this research project, I felt it important to contribute something to the debate surrounding this event.[21] It was to the end of finding a way to approach this event that, in the previous section, I reflected back on my work here, and devised a revised object of study. If the long-term effects of this event are still unclear, it strikes me that it is nonetheless possible to speak of the 'fire-space' that is currently being constructed around Grenfell. Likewise, I think it is clear to see that this event has provided a kind of 'trial' for particular regulatory frameworks, and the modes of construction that they warrant. My ambition in this postscript is therefore twofold. I want to use the Grenfell Tower fire as a means to test those terms and concepts outlined in the conclusion to this dissertation, and in doing so, develop a preparatory sketch for planned future research. There are many ways in which this might be done - as I type, material is released, from diverse sources, on a daily basis. Here I limit myself to reflection on two key sources, drawing attention to some consistencies and contradictions between them that seem to me consequential.

Probability of One

The first source I wish to review are expert witness reports presented to the Grenfell Tower Inquiry on June 4th, 2018. One of those reports was provided by Luke Bisby, Professor of Fire and Structures at the University of Edinburgh. Luke was asked to report on perhaps the most distinctive aspect of that fire; the route it took in spreading to, and through, the refurbishment cladding. I quoted his summary of that trajectory in full, above. Bisby's finding were not surprising; he confirmed the already popularly held view that the fire most likely spread through flammable filler material located between the original concrete structure and the refurbishment windows [fig. 7.3]. But the important phrase here is 'most likely'. In the introduction to his report, Bisby spends some time noting the "extraordinarily complex technical challenge" of determining the precise trajectory of any fire through forensic examination. Furthermore he notes that, at the Grenfell Tower, that is made all the more difficult by the nature of





Section A-A (below window)


Window opening
Fridge-freezer
Cooker
Toaster
Washing machine (displaced)
Microwave
Freezer
Fridge

fig. 7.4
MET00007788: Flat 16 Kitchen arrangement
Figure 12. Bisby, Luke. 'Professor Luke Bisby's Expert Report'. Grenfell Tower Inquiry, 2018. Source: www.grenfelltowerinquiry.org.uk

Metropolitan Police photograph of the arrangement of Kitchen 16, Grenfell Tower, annotated and reproduced in Luke Bisby's report.

the cladding, which is itself "a highly complex system, consisting of multiple materials and products, many of which are combustible".[22] If this reads like professional prevarication, it is, but nonetheless it makes an important point. Indeed, the majority of Bisby's report is concerned with the alternative routes that the fire also took, and the difficulty of determining which it took first; fire certainly travelled through gaps between the window and the structure, but it also travelled through an extract fan, through filler around the fan opening, by burning through an infill panel, and through the open window itself. [fig. 7.2]

Explaining the process through which fire both creates and moves through such points of failure, Bisby outlines a process called *pyrolysis*, or 'fire separation'. As things burn, they are separated into their component parts. For instance, wood does not 'burn' directly; it's cellulose decomposes when exposed to heat, releasing a gas which then oxidises in the atmosphere, releasing heat that then continues this chain reaction. In an analogous way, the cladding panels and window arrays used at Grenfell do not ignite directly when exposed to a flame. But should a sustained fire take hold near to them, those material assemblies begin to delaminate, exposing their flammable interiors. That is, fire destroys our material things in a particular way; it decomposes them, and spreads by creating and exploiting gaps between their component parts. And what is conspicuous about Bisby's description of the Grenfell tower fire is the sheer quantity of potential lines of failures. The refurbishment projects included a wide range of different components, almost all of which were flammable, resulting in a material assembly that was thermally 'thin'.[23] By highlighting the 'complexity' of his task, then, it seems to me that Bisby tacitly questioned its purpose; what is the significance of determining the *actual* route this fire took, given that the possible routes were so multiple?

That question is posed explicitly by the second expert witness report I wish to consider. José Luis Torero, John L. Bryan Chair in the Department of Fire Protection Engineering at the University of Maryland - also Bisby's former boss at Edinburgh - was asked to report on the source of the Grenfell fire. That source had already been popularly attributed to a malfunctioning fridge within the kitchen of flat 16 [fig. 7.4]. Again, this report begins by noting the complexity of the task presented: "Fire evolves in space and time leading, in many instances, to a complex sequence of events and multiple processes and activities occurring simultaneously". And again, the report contains no surprise; Torero finds no evidence to confirm or contradict the existing view: "[A]t the date of submission of this report, there is no conclusive evidence that constrains the cause, origin and initial stages of the fire to a single timeline or set of events".[24] Torero does confirm that smoke from a malfunctioning refrigerator *could* have melted the nearby kitchen window, exposing flammable components within the buildings external cladding; uPVC loses it mechanical properties at around 90°C, whereas the smoke from such a fire would be likely be 100-200°C. However, he

goes on to demonstrate that the same result could have been caused by a pan-fire, or indeed the malfunction of almost any common appliance (the Lakanal House fire, of 2009, which also spread via a window, to the external cladding, was started by a faulty TV). As such, the specific source is not only unknown, but also in his view, irrelevant: "From a design perspective, a fire of 300kW occurring in a residential kitchen, and in the proximity of the window, should be considered to have a probability of one. A fire of this nature will happen in a residential unit and therefore the building is required to respond appropriately"[25]. We might conclude that the 'complexity' cited by both reports therefore belies a simplicity of findings; fires happen, and when buildings are made of plastic, they burn.

Ownership of Risk

Complexity is also a theme of *Building a Safer Future: The Independent Review of Building Regulations and Fire Safety,* led by Dame Judith Hackitt. This review was commissioned by the Ministry of Housing, Communities and Local Government with a brief - concurrent to that of the Inquiry - to determine what changes might be required to our building standards in light of Grenfell. Again, Hackitt begins her report by noting the complexity of *her* task; surveying our existing regulatory frameworks [fig. 7.5] she finds them "highly complex – involving multiple routes, regulators, duty holders and differing (and overlapping) sets of legislation".[26] And – in something like a sociological parallel to Bisby's technical analysis - she identifies concerns in the way that these different sets of regulation hold together. The UK's regulatory structure is, in her view, not 'fit-for-purpose'; it is characterised by a lack of clarity over discreet roles and responsibilities and inadequate enforcement, leading to ignorance and indifference toward governmental goals. Indeed, she acknowledges that recent de-regulatory initiatives – private sector warrant approvals, the ambiguity of performance-based standards, lack of supporting expertise – have created a 'competition of interpretation' that drives a 'race to the bottom', through which individual actors have sought to 'game the system'. But complexity is not necessarily the enemy for Hackitt. To address the risk of failures occurring between different components of our regulatory frameworks, Hackitt suggests the need to a new set of regulations specifically for 'High-Rise, High-Risk' buildings.[27] And in setting out the nature of that framework, she creates her own socio-technical metaphor. If that new framework is to secure the engagement of a multitude of different actors, its design must Hackitt contends that, if it is to work, that framework must be built in the image of the buildings it hopes to create. It must recognise "the reality of most high-rise buildings, which operate as a complex inter-locking system".[28] What Hackitt suggests is needed to pull all those components together, and so to build a safer future, is the clear "ownership of risk" [29]. The root cause of the Grenfell fire was, in her opinion, that responsibility for fire-safety was not properly defined, it 'fell through the cracks'. This was possible, she suggests, because our existing, predominantly prescriptive regulations, attribute too much of a role to government,

fig. 7.5 [next spread]
Map of the current regulatory system for high-rise residential buildings
Figure 1, *Building a Safer Future: independent Review of Building Regulations and Fire Safety*, May 2018, Dame Judith Hackitt.

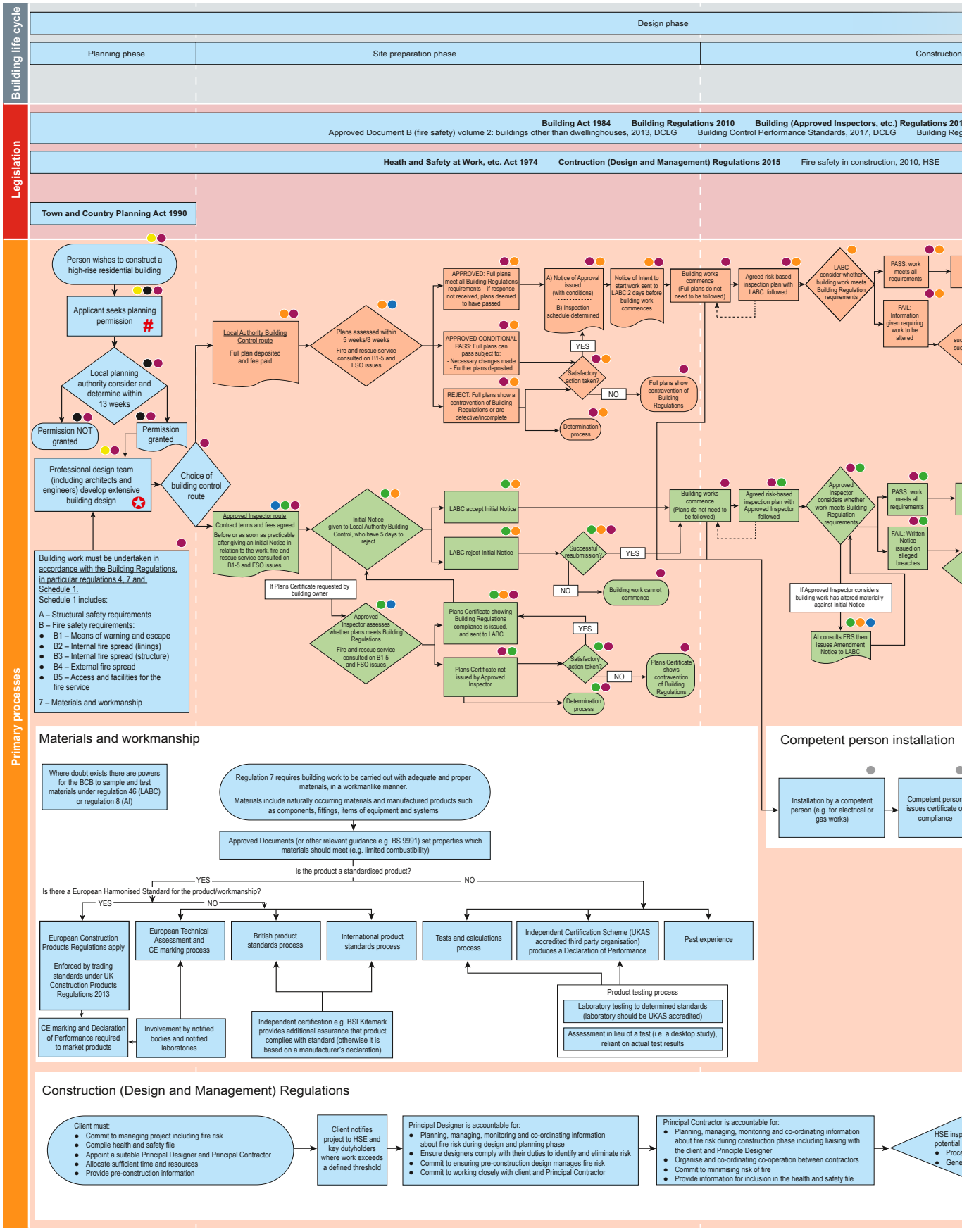
"The interim report included an outline map of the existing regulatory system insofar as it applied to the design, construction, occupation and maintenance of a high-rise residential building. Even though it did not cover all detailed scenarios, it was still **highly** complex – involving multiple routes, regulators, dutyholders and differing (and overlapping) sets of legislation."

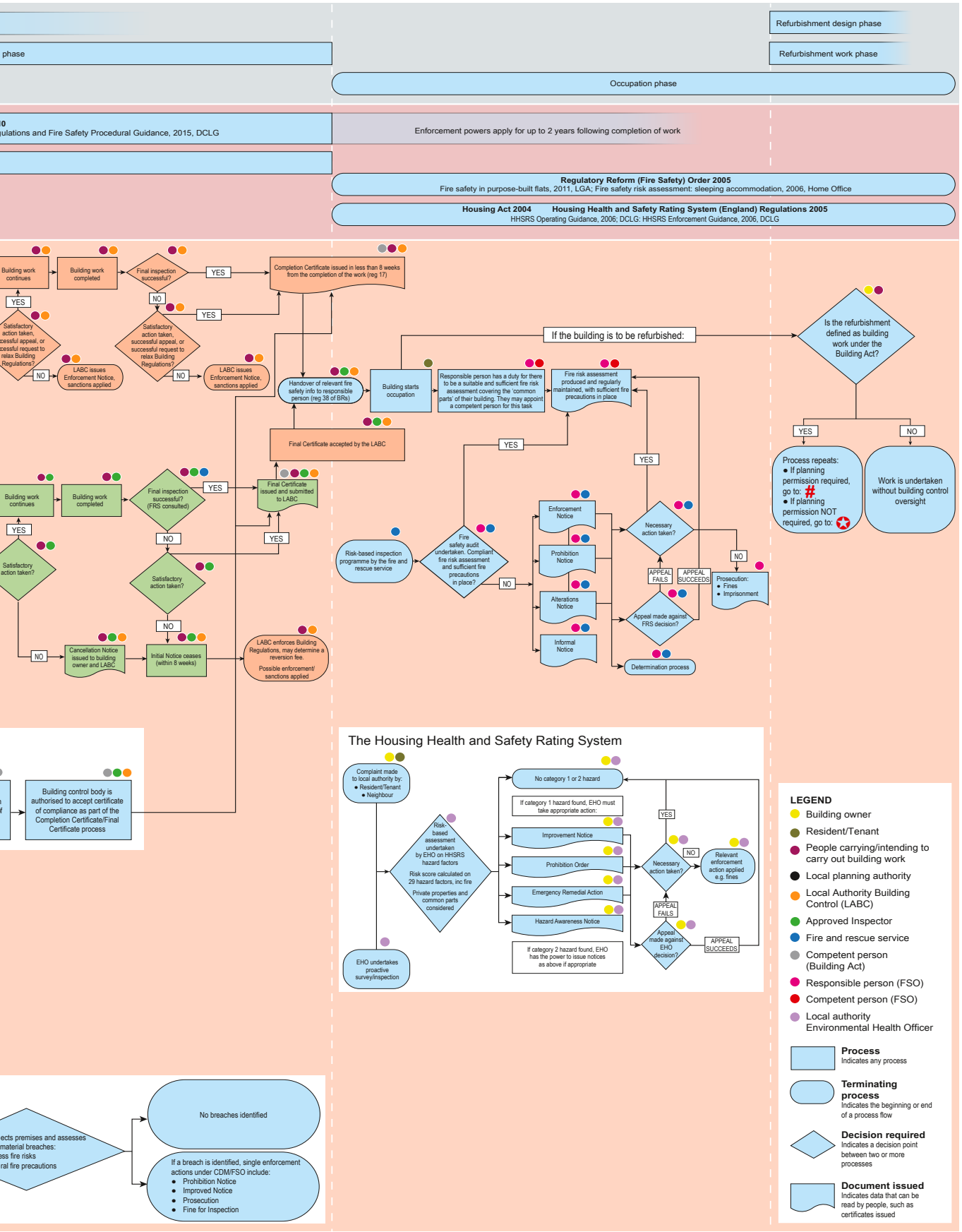
and so breed ignorance and indifference in those who actually commission, design, and manage buildings.

Unlike the expert witness reports, Hackitt's review did prompt surprise. Indeed, it sparked an immediate political and media controversy, being dubbed a "disappointment", a "betrayal and whitewash".[30] The reason for this surprise was Hackitt's refusal to include, within her guidelines for 'high-rise high-risk' structures, a ban on the use of flammable materials. That is, unlike the expert witnesses, Hackitt does not attribute the cause of the fire to the prevalence of flammable material in its constructions. Defending her report in light of its reception, she argued that "simply adding more prescription, or making amendments to the current system, such as restricting or prohibiting certain practices, will not address the root causes".[31] There has been much speculation as to why Dame Hackitt did not move for such a ban, with claims of a conflict of interest, indeed her appointment was controversial; in a previous role, Hackitt led a body that approved and promoted cladding and insulation similar to those used in the tower.[32] But ulterior motives are not required to understand her logic; what Dame Hackitt calls for in her report is a further transfer of responsibility away from government, whose role should be limited to one of setting performance standards. What is required, she suggests, is a "clear model of risk ownership, with clear responsibilities for the Client, Designer, Contractor and Owner to demonstrate the delivery and maintenance of safe buildings". Banning flammable materials would be counter-productive to that agenda; any new regulations, she argues, must be "truly outcomes-based (rather than based on prescriptive rules and complex guidance) and it must have real teeth, so that it can drive the right behaviours. This will create an environment where there are incentives to do the right thing and serious penalties for those who choose to game the system".[33]

Institutional Pyrolysis

Reading between these two sources, something strikes me as anomalous, causes concern, prompts enquiry. It is the contention, by Dame Hackitt, that a proposed new regulatory frameworks must 'recognise the reality of high-rise construction'. It is easy to balk at such a naturalising statement, easy to point out that the 'reality' of high-rise construction is, of course, constructed. For instance, we need only shift our focus onto the original structure of Grenfell Tower to find a quite different 'reality'. That tower – built, owned and managed by the state, largely out of a single, thermally thick material, is – in socio-technical terms - quite monolithic. The particular 'reality' to which Hackitt refers is one that has been built since that tower, and it represents the material form of a governmental programme whose purpose is precisely to break up the construction process into small component parts, and to subcontract their liability, so as to isolate particular actors from financial risk. That is, Hackitt's solution seems to reinforce her problem; surely it is the


Building life cycle
Design phase
Planning phase
Site preparation phase
Construction
Legislation
Building Act 1984
Building Regulations 2010
Building (Approved Inspectors, etc.) Regulations 201
Approved Document B (fire safety) volume 2: buildings other than dwellinghouses, 2013, DCLG
Building Control Performance Standards, 2017, DCLG
Building Reg
Heath and Safety at Work, etc. Act 1974
Contruction (Design and Management) Regulations 2015
Fire safety in construction, 2010, HSE
Town and Country Planning Act 1990
Primary processes
Person wishes to construct a high-rise residential building
Applicant seeks planning permission
Local planning authority consider and determine within 13 weeks
Permission NOT granted
Permission granted
Professional design team (including architects and engineers) develop extensive building design
Choice of building control route
Building work must be undertaken in accordance with the Building Regulations, in particular regulations 4, 7 and Schedule 1.
Schedule 1 includes:
A – Structural safety requirements
B – Fire safety requirements:
B1 – Means of warning and escape
B2 – Internal fire spread (linings)
B3 – Internal fire spread (structure)
B4 – External fire spread
B5 – Access and facilities for the fire service
7 – Materials and workmanship
Local Authority Building Control route
Full plan deposited and fee paid
Plans assessed within 5 weeks/8 weeks
Fire and rescue service consulted on B1-5 and FSO issues
APPROVED: Full plans meet all Building Regulations requirements – if response not received, plans deemed to have passed
APPROVED CONDITIONAL PASS: Full plans can pass subject to:
- Necessary changes made
- Further plans deposited
REJECT: Full plans show a contravention of Building Regulations or are defective/incomplete
A) Notice of Approval issued (with conditions)
B) Inspection schedule determined
YES
Satisfactory action taken?
NO
Full plans show contravention of Building Regulations
Determination process
Notice of Intent to start work sent to LABC 2 days before building work commences
Building works commence (Full plans do not need to be followed)
Agreed risk-based inspection plan with LABC followed
LABC consider whether building work meets Building Regulation requirements
PASS: work meets all requirements
FAIL: Information given requiring work to be altered
Approved Inspector route
Contract terms and fees agreed Before or as soon as practicable after giving an Initial Notice in relation to the work, fire and rescue service consulted on B1-5 and FSO issues
Initial Notice given to Local Authority Building Control, who have 5 days to reject
If Plans Certificate requested by building owner
Approved Inspector assesses whether plans meets Building Regulations
Fire and rescue service consulted on B1-5 and FSO issues
LABC accept Initial Notice
LABC reject Initial Notice
Plans Certificate showing Building Regulations compliance is issued, and sent to LABC
Plans Certificate not issued by Approved Inspector
YES
Satisfactory action taken?
NO
Plans Certificate shows contravention of Building Regulations
Determination process
Successful resubmission?
YES
NO
Building work cannot commence
Building works commence (Plans do not need to be followed)
Agreed risk-based inspection plan with Approved Inspector followed
Approved Inspector considers whether work meets Building Regulation requirements
PASS: work meets all requirements
FAIL: Written Notice issued on alleged breaches
If Approved Inspector considers building work has altered materially against Initial Notice
AI consults FRS then issues Amendment Notice to LABC
Materials and workmanship
Where doubt exists there are powers for the BCB to sample and test materials under regulation 46 (LABC) or regulation 8 (AI)
Regulation 7 requires building work to be carried out with adequate and proper materials, in a workmanlike manner.
Materials include naturally occurring materials and manufactured products such as components, fittings, items of equipment and systems
Approved Documents (or other relevant guidance e.g. BS 9991) set properties which materials should meet (e.g. limited combustibility)
Is the product a standardised product?
YES
NO
Is there a European Harmonised Standard for the product/workmanship?
YES
NO
European Construction Products Regulations apply
Enforced by trading standards under UK Construction Products Regulations 2013
CE marking and Declaration of Performance required to market products
European Technical Assessment and CE marking process
Involvement by notified bodies and notified laboratories
British product standards process
International product standards process
Independent certification e.g. BSI Kitemark provides additional assurance that product complies with standard (otherwise it is based on a manufacturer's declaration)
Tests and calculations process
Independent Certification Scheme (UKAS accredited third party organisation) produces a Declaration of Performance
Past experience
Product testing process
Laboratory testing to determined standards (laboratory should be UKAS accredited)
Assessment in lieu of a test (i.e. a desktop study), reliant on actual test results
Competent person installation
Installation by a competent person (e.g. for electrical or gas works)
Competent person issues certificate of compliance
Construction (Design and Management) Regulations
Client must:
Commit to managing project including fire risk
Compile health and safety file
Appoint a suitable Principal Designer and Principal Contractor
Allocate sufficient time and resources
Provide pre-construction information
Client notifies project to HSE and key dutyholders where work exceeds a defined threshold
Principal Designer is accountable for:
Planning, managing, monitoring and co-ordinating information about fire risk during design and planning phase
Ensure designers comply with their duties to identify and eliminate risk
Commit to ensuring pre-construction design manages fire risk
Commit to working closely with client and Principal Contractor
Principal Contractor is accountable for:
Planning, managing, monitoring and co-ordinating information about fire risk during construction phase including liaising with the client and Principle Designer
Organise and co-ordinating co-operation between contractors
Commit to minimising risk of fire
Provide information for inclusion in the health and safety file


Refurbishment design phase
phase
Refurbishment work phase
Occupation phase
ulations and Fire Safety Procedural Guidance, 2015, DCLG
Enforcement powers apply for up to 2 years following completion of work
Regulatory Reform (Fire Safety) Order 2005
Fire safety in purpose-built flats, 2011, LGA; Fire safety risk assessment: sleeping accommodation, 2006, Home Office
Housing Act 2004
Housing Health and Safety Rating System (England) Regulations 2005
HHSRS Operating Guidance, 2006; DCLG: HHSRS Enforcement Guidance, 2006, DCLG
Building work continues
Building work completed
Final inspection successful?
YES
NO
Completion Certificate issued in less than 8 weeks from the completion of the work (reg 17)
Satisfactory action taken, successful appeal, or successful request to relax Building Regulations?
LABC issues Enforcement Notice, sanctions applied
Handover of relevant fire safety info to responsible person (reg 38 of BRs)
Building starts occupation
Responsible person has a duty for there to be a suitable and sufficient fire risk assessment covering the 'common parts' of their building. They may appoint a competent person for this task
Fire risk assessment produced and regularly maintained, with sufficient fire precautions in place
If the building is to be refurbished:
Is the refurbishment defined as building work under the Building Act?
Process repeats:
• If planning permission required, go to: #
• If planning permission NOT required, go to:
Work is undertaken without building control oversight
Final Certificate accepted by the LABC
Final inspection successful? (FRS consulted)
Final Certificate issued and submitted to LABC
Satisfactory action taken?
Cancellation Notice issued to building owner and LABC
Initial Notice ceases (within 8 weeks)
LABC enforces Building Regulations, may determine a reversion fee.
Possible enforcement/ sanctions applied
Risk-based inspection programme by the fire and rescue service
Fire safety audit undertaken. Compliant fire risk assessment and sufficient fire precautions in place?
Enforcement Notice
Prohibition Notice
Alterations Notice
Informal Notice
Necessary action taken?
Appeal made against FRS decision?
APPEAL FAILS
APPEAL SUCCEEDS
Prosecution:
• Fines
• Imprisonment
Determination process
Building control body is authorised to accept certificate of compliance as part of the Completion Certificate/Final Certificate process
The Housing Health and Safety Rating System
Complaint made to local authority by:
• Resident/Tenant
• Neighbour
Risk-based assessment undertaken by EHO on HHSRS hazard factors
Risk score calculated on 29 hazard factors, inc fire
Private properties and common parts considered
EHO undertakes proactive survey/inspection
No category 1 or 2 hazard
If category 1 hazard found, EHO must take appropriate action:
Improvement Notice
Prohibition Order
Emergency Remedial Action
Hazard Awareness Notice
If category 2 hazard found, EHO has the power to issue notices as above if appropriate
Necessary action taken?
Relevant enforcement action applied e.g. fines
Appeal made against EHO decision?
APPEAL FAILS
APPEAL SUCCEEDS
ects premises and assesses
material breaches:
ss fire risks
ral fire precautions
No breaches identified
If a breach is identified, single enforcement actions under CDM/FSO include:
• Prohibition Notice
• Improved Notice
• Prosecution
• Fine for Inspection
LEGEND
Building owner
Resident/Tenant
People carrying/intending to carry out building work
Local planning authority
Local Authority Building Control (LABC)
Approved Inspector
Fire and rescue service
Competent person (Building Act)
Responsible person (FSO)
Competent person (FSO)
Local authority Environmental Health Officer
Process
Indicates any process
Terminating process
Indicates the beginning or end of a process flow
Decision required
Indicates a decision point between two or more processes
Document issued
Indicates data that can be read by people, such as certificates issued

'reality' of contemporary high-rise construction which should here be under scrutiny?

I think we can begin that scrutiny by reading *Building a Safer Future* against the expert witness reports of discussed above. That is, it seems to me that those reports offer a 'reality test' for the govern-mentality proposed in Hackitt's report. All three of these authors recognise that our buildings, and our buildings standards, are comprised of mutually dependent, interlocking components, whose relationships comprise potential lines of failure. What Hackitt suggests is that the strength of the whole, at the social level, depends precisely on that capacity for failure, as a force for responsibilisation. What we need is to be able to individualise the point of failure, and to punish it. However, what Bisby and Torero suggest is the technical difficulty of making such localisations. Following the trajectory of this particular fire, through the social and technical structures that were designed to prevent it, is it possible to individualise the components that failed, and to punish them meaningfully? What I want to do in this post-script, then, is to put Hackitt's metaphor on 'trial'. I want to offer a brief legal parallel to Bisby's technical analysis of this fire, showing how, in the political heat of this event, our regulatory frameworks for fire-safety came apart in such a way as to make it difficult to locate a single point of failure. And by doing so, I want to suggest that particularities of the Grenfell Tower, and of the way that it burned, are today providing a kind of resistance to the govern-mentalities within which some seek to enrol them.

Cladding that is and is not Cladding

In the immediate aftermath of the Grenfell fire, political discourse and the news media were rife with discussion as to how the refurbishment cladding had been permitted, and whether it complied with current UK standards. That discussion was a legal proxy through which to identify who should bear responsibility for the event. The conservative government, in the form of Phillip Hammond, was quick to state that the cladding used on the building was banned for use in the UK.[34] He was backed up in this claim by the Department of Communities and Local Government – the body that oversea building regulation in England – who released a statement that: "Cladding using a composite aluminium panel with a polyethylene core would be non-compliant with current building regulations guidance. This material should not be used as cladding on buildings over 18m in height."[35] These statements, if they were true, would seem to insulate government from any claim of regulatory negligence, and to prohibit the contractor from any limit in liability. Rydons, the contractor who completed the refurbishment, claimed however that the design "met all required building control, fire regulation and health and safety standards".[36] This ambiguity was not assisted by the Royal Borough of Kensington and Chelsea, the owner of the tower, client for its renovation, and also the body responsible for warranting its compliance with building standards.

Shortly after the fire they revealed that a warrant had never been issued for its refurbishment: designs had been submitted to, and reviewed by the council, but "a formal decision notice was not issued for the plans".[37] The fire brigade, questioned as to their role in certifying the buildings for fire-safety – a role that was subject to a parallel furore, on account of its recent de-regulation and privatisation[38] – noted that their powers only extended to reviewing the internal design of buildings, and that they had no power to comment on cladding design.[39]

The ambiguity that allowed Phillip Hammond and Rydons to make contradictory claims about the cladding is, unfortunately, written in to the relevant building standards. In England and Wales, the performance specification for external fire spread is defined by mandatory standard B4 (1), of *Approved Document B*. This regulation states that "The external walls of the building shall adequately resist the spread of fire over the walls".[40] In hindsight it might seem self-evident that the cladding used at Grenfell Tower – a Reynobond composite comprising two 0.5mm-thick aluminium sheets fixed to a 6mm-thick core of polyethylene – fail to satisfy this standard. But that was not the view prior to this event. Indeed, the material *does* meet the prescriptive requirements associated with standard B4. Paragraph 12.6 of Approved Document B states that the external surface of an external wall will meet that standard if it achieves a 'Class O' rating for surface spread of flame and fire propagation. Reynobond's aluminium cladding systems were certified to achieve that rating by the British Board of Agrément, through a test that involves exposing their aluminium face to flame [fig. 7.6]. Exposed at its centre, that aluminium coating did not reveal the polyethylene core, and so was classed as a permissible 'surface'. That this surface also had an interior was simply not visible to this means of testing, and as such was easily ignored by constructional industry professionals. As some would put it; "It's not within the imagination of the [industry] that the panel can come away and expose the flammable materials behind."[41] Unsurprisingly, after Grenfell, the Department of Communities and Local Government did become more imaginative: in order to sure up what might seem like a regulatory failure, it released a statement noting that "For the avoidance of doubt the core (filler) within an aluminium composite material (ACM) is an 'insulation material/product', 'insulation product', and/or 'filler material' as referred to in Paragraph 12.7... of Approved Document B".[42] The significance of this statement is that insulation products are subject to the more onerous demand of demonstrating 'limited combustibility', that is, of surviving for at least 2 hours in a 750°C furnace.

It was a little late, on the 22nd June, 2017, to seek the avoidance of doubt, and the need for parentheses within this statement - to change the name of what it sought to define - doesn't help. It's possible to call a cladding panel an insulant, even if it has no insulating function, but that doesn't lend to clarity. And that lack of clarity was not a surprise, was not unknown; it had been carefully

constructed, over the years, by a plastics industry keen to develop products for use in high-rise settings, and by a government unsure how to achieve the energy saving targets it had agreed to through the Kyoto protocol. But that uncertainty – around an important issue, which is perhaps the most open aspect of the circumstances that led to Grenfell - has also made it difficult to determine whether this particular cladding was compliant, and so who was responsible for its failure.

fig. 7.6
CER 08/4510 Alcoa Architectural Products. Product sheet 1 - Reynobond Architecture wall cladding panels
Agrement Certificate CER 08/4510, British Board of Agrement, 2008. Source: www.thenbs.com

Product Sheet for Reynobond Architectural Wall Cladding Panels, as used in Grenfell Tower, provided by the British Board of Agrement. The document certifies that "in relation to the Building Regulation for reaction of fire, the panel may be regarded as having a Class O surface in England and Wales, and a 'low risk' in Scotland".

Rivets that are and are not There

We might readily agree with Dame Hackitt, then, in her insistence that our prescriptive standards are not fit for purpose, but the Grenfell fire does not provide evidence as to the rigor of our performance-based standards for fire, either. For instance, it might seem unthinkable, in light of this event, that Celotex RS5000 – the polyisocyanurate foam insulation used on the tower - could be construed to demonstrate 'limited combustibility'. Indeed, the fire-load of this material is extraordinarily high; "If you look at a one metre by one metre square section [of cladding] that will have about three kilograms [of polyethylene], the equivalent of about five litres of petrol."[43] However, although this material could not meet that prescriptive standard, its manufacturers have successfully argued that it can be used to "adequately resisting the spread of flame", through performance-based modes of regulation. These forms of regulation were first developed by the Building Research Establishment (BRE), with the view to testing how whole material arrays, as opposed to individual buildings components, perform in fires. This form of standardisation operates through the use of full-scale mock-ups, which are then subjected to a standardised test, defined by *British Standard 8414: Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems.* That test requires the mock-up wall to resist the spread of flame across its height for at least 30 minutes. [fig. 7.7]

This mode of standardisation, however, is expensive. It would be costly and impractical to test every material assembly in use across the UK today. And under pressure, both from government, and from the plastics industry, this route to approval has gradually been de-regulated. Today, wall assemblies can be approved on the basis of 'desktop studies' – studies that argue that an assembly *would* survive a BS8414 test – and those studies can be completed by any 'suitable qualified fire specialist' – despite their being no suitable qualification stipulated. Furthermore it had, by 2016, become common practice for non-governmental bodies – such as the NHBC, or the Energy Saving Trust, Dame Hackitt's former employer – to suggest combinations of materials, including those used at Grenfell, that might be used without the need for desktop studies. These relaxations have allowed the widespread use of highly flammable insulation materials in high-rise buildings. This fact was recognised by Teresa May when, days after Grenfell, she announced that "a

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BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
No 08/4510

PRODUCT SHEET 1 — REYNOBOND ARCHITECTURE WALL CLADDING PANELS

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate of Confirmation relates to Reynobond Architecture Wall Cladding Panels, aluminium/polyethylene composite panels used to provide a decorative/protective façade over the external walls of buildings.

AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Practicability of installation — the panels are suitable for installation by cladding contractors providing they have undergone suitable training (see section 4).

Strength and stability — the panels can be incorporated in a cladding system designed to resist the wind loads normally encountered in the UK (see section 5).

Behaviour in relation to fire — in relation to the Building Regulations for reaction to fire, the panels may be regarded as having a Class 0 surface in England and Wales, and a 'low risk' material in Scotland (see section 6).

Air and water penetration — provided all joints between panels are adequately baffled, the cladding will minimise water entering the cavity. Any water collecting in the cavity will be removed by drainage and ventilation (see section 7).

Maintenance — damaged panels may be replaced individually without disturbing adjacent ones (see section 8).

Durability — in normal UK conditions, the panels should have a service life in excess of 30 years (see section 9).

The BBA has awarded this Agrément Certificate for Reynobond Architecture Wall Cladding Panels to Alcoa Architectural Products as fit for their intended use provided they are installed, used and maintained as set out in this Agrément Certificate.

On behalf of the British Board of Agrément

Date of First issue: 14 January 2008

Greg Cooper: Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Pool fire in front of test assembly
Escalation above test assembly
Damaged ACM
Exposed PIR insulation
Time in video: 7:22
Time in video: 7:46
Time in video: 8:44
After test

fig. 7.7
CLG10000380: BS 8414 test, Grenfell cladding materials.
Figure 95. Bisby, Luke. 'Professor Luke Bisby's Expert Report'. Grenfell Tower Inquiry, 2018. Source: www.grenfelltowerinquiry.org.uk

This figure shows "Annotated extracts from DCLG video [CLG10000380] showing the progression of the fire during an 8.5 m tall BS 8414-1 [16] test on a cladding arrangement that used similar rainscreen (Test DCLG1), cavity thermal insulation, and cavity barrier products to the Grenfell Tower cladding refurbishment external cladding build up." Bisby uses these tests to support the hypothesis that the rapid spread of flame within this fire was primarily due to the presence of ACM cassettes with polyethylene filler.

number" of other high-rise residential tower blocks within the UK might use a similar cladding system to that used at Grenfell. The immediate effect of this announcement was the evacuation of 800 households from the Chalcot Estate, and a promise by Camden Council to re-clad all towers in their ownership, that used similar materials. Following that announcement, the Ministry of Housing, Communities and Local Government launched a series of tests, via BS8414, to determine the safety of ACM cladding more generally. 299 of the 312 social-tenure high-rise buildings tested by January 2018 had failed those tests and were deemed in need of re-cladding. Figures within the private sector – where this form of cladding and insulation is widespread – are not known. [44]

But the methodology of BS8414 also came under scrutiny as a result of Grenfell. The closest full-scale testing to the wall build-up used at Grenfell Tower had been completed by BRE in 2014. This tested Celotex RS5000 in combination with a fibre-cement rainscreen, a more thermally 'thick' cladding. However, shortly after Grenfell, BRE released a statement withdrawing those test results. They had been made aware by the manufacturer of "anomalies between the design specification for the cladding system and the actual cladding system they installed to be tested."[45] BRE were not surprisingly keen to stress that they took no responsibility for the way in which the cladding system was constructed; this was strictly the responsibility of the manufacturer. How Celotex rigged that test is unknown; the test results are confidential and proprietary. However, we can make an educated guess on the basis of research commissioned by the Association of British Insurers. This body – no doubt wary of its own collective liability - asked the Fire Protection Association to compare the parameters of BS8414 with the 'real-world' conditions that it simulated. They found it to be unrepresentative in a number of ways: domestic fires often include plastics, and so burn hotter than the test recognizes; cladding systems are often tested as sealed units, when in reality they have ventilated cavities which provide conduits for fire-spread; and the test uses material in "manufacturers conditions", when in practice they will be compromised by further openings, such as those required for vents and windows.[46] All of these issues were material within the Grenfell fire. But more damningly ABI's report – which was submitted to Dame Hackitt and seems tacitly acknowledged in her introduction - alleges that some manufacturers "game the system" in precisely the way that BRE's statement suggests, by testing constructional arrangements that are not as per the published design specification. Specifically, they draw attention to a practice of riveting components in an assembly together, intentionally stopping them from delaminating when subjected to heat.[47] The implication of their report is that far more than 312 towers are in need of inspection, via tests more onerous than those that have found 96% of those tested to be unsafe.

Grenfell Objects

I have outlined this legal parallel to the technical failure of Grenfell tower so as to ask, in Dame Hackitt's socio-technical metaphor, what is significance of a rivet that is necessary, but also absent? At the technical level we know that, for the manufacturer, those rivets were something needed in order to satisfy a particular governmental rationale, but that were for some reason impractical in the 'real-world' condition of a building site. They were impossibly present, impossibly absent. Those rivets are the negative image of an aircraft, falling apart as it is tested under turbulent conditions. They represent not the replaced experience of failure, but the foreknowledge of its occurrence, by-design. Perhaps, if those rivets really exist, and if they receive a subpoena, they might act as the key witness through which Celotex is convicted of corporate manslaughter. And in that eventuality, Dame Hackitt's ambition for a toughened environment of enforcement might be satisfied. Maybe Celotex can foot the bill for Grenfell; they are owned by Saint-Gobain, the French multinational, whose total assets are currently valued at around €43 billion. A suit that took out an actor of this scale might just have the effect to 'responsibilise' industry.

But wouldn't such a verdict be, at another level of abstraction, just another way to hang responsibility on an actant we would like to pretend exists, but who we know is not really there? The reason that so much hangs on those rivets, and on Celotex, is that our regulatory frameworks have already been constructed - long before Dame Hackitt's intervention – as a means to outsource responsibility for safety to the private sector. Our prescriptive codes for spread of flame, our performance-based standards, the outsourcing of BS8414 test, the use of desktop studies, the privatisation of fire-safety inspections and of warrant approvals, and the clarifying statements of DCLG; what has become publicly visible in the aftermath of Grenfell is the degree to which all of these function to move responsibility away from bodies who we have created to assume it, onto actors for whom a competition of interpretation is incentivised.

So; here is one way that our regulatory frameworks are *not* like our built structures. In the slow-motion replay of the Grenfell tower fire that is now occurring within the courts, our social and institutional actors are proving themselves quite good at insulating themselves from the risk of this event, and our regulatory frameworks are serving them well to this regard. But the same can't be said for their technical delegates. As fire spread through them, it took them all with it. That is, what events like Grenfell – or those that undermined the private enterprise brigades of 18th C. Edinburgh, or the 'war-footing' of the Tokagawa Shogunate – is that fire is an actant that networks whether we like it or not. Fire, like the buildings and the cities that are its base, is a technology that socialises risk, even if we don't want it to. Just as Torero questions the purpose of locating a single point of technical failure, I mean here to question the purpose of identifying a single point of institutional failure. What

fig. 7.8 [next spread]
Grenfell Tower, June 17th 2017
Photograph David Mirzoeff / PA.
Source: www.theguardian.com

would it mean to use the public inquiry, or the police investigation, to punish a single individual or company when, in the 'real world' condition, we know that that responsibility falls to others. We cannot expect a bankrupt insulation manufacturer, after the fact, to save the lives of survivors, to rehouse the homeless, to care for the bereaved, to conduct the inquiries, or the police investigations that would indict them, to review the legislation they abused, to re-clad all those towers that they shouldn't have clad in the first place.

What I think we can see flickering here - if we reflect on the absent presence of that rivet, or if we look at the charred ruin of the tower itself - is the need for Government. We see the presence of a wide variety of competing interests – occupant safety, environmental performance, profitability, problems of economic inequality, or of racism – coinciding on a common thing. We see the need to come together to better determine that thing, to channel those interests through common concerns. Hackitt's report failed to do that. It couldn't replace the vomit that Grenfell has left in so many offices. And it failed to do that, surely, because to construe our regulatory frameworks as means to responsibilise through punishment – rather than proscribe against well understood risks – is politically untenable; indeed, at the level of governmental, it could only be construed as another act of corporate manslaughter. Her report was quickly denounced by the media, by the opposition, and also by the RIBA. And under pressure from that outcry - against their own declared policy positions, and against the advice that they paid for – Teresa May's government launched a consultation on banning the use of combustible materials in high-rise construction.[48] The findings of that consultation, and the long-term significance of Hackitt's report, and the inquiry more broadly, are still unclear. But nonetheless I describe this one episode as evidence of the kind of 'trial' that Grenfell is posing to this government, and to the prevailing govern-mentality of our fire-safety standards. Through particularities of this fire, and that building, Grenfell is resisting some of the ways we seek to enrol it. Against a call for this event to not be 'politicised', for the need for impartial findings, I have described that resistance, that trial, as an attempt to define the socio-technical 'objectivity' of Grenfell.[49]

(Endnotes)

1 Obligatory Passage Point is a term used within STS literatures to define a problem that effectively forces actors together into collaboration. See Callon and Law's "The Life and Death of an Aircraft" in Wiebe E. Bijker, ed., *Shaping Technology / Building Society: Studies in Sociotechnical Change*, New Ed edition (Cambridge, Mass.: MIT Press, 1994). Also their "Engineering and Sociology in a Military Aircraft Project" in Susan Leigh Star, 'Ecologies of Knowledge: Work and Politics in Science and Technology', 1995.

2 'Why Fire Makes Us Human | Science | Smithsonian', accessed 25 July 2018, https://www.smithsonianmag.com/science-nature/why-fire-makes-us-human-72989884/.

3 Gaston Bachelard, *Psychoanalysis of Fire*, New edition edition (Beacon Press, 1977). P. 10

4 Bachelard.p. 14

5 I cannot support this observation through publication, but make it drawing upon discussions experience between colleagues within the BRE centre for fire safety engineering, at the University of Edinburgh.

6 John Law and Annemarie Mol, 'Situating Technoscience: An Inquiry into Spatialities', *Environment and Planning D: Society and Space* 19, no. 5 (1 October 2001): p. 611. I thank Helen Runting for directing me to this text.

7 We can readily translate their argument to the field of building design. As architects, we like to think of building design as something immutable and immobile. This is important for our own govern-mentality, allowing us to imagine our creations as coherent utterances, fixed in place, and in internal relationship, through time. Our concerns here overlap with those of the state, for whom it is important to conceive of buildings as reliable and ongoing modes of law-enforcement. It is also easy to accept that codes, standards, rules, and regulations can sometime operate like an immutable mobiles; abstract those concrete utterances, so as to make them moveable, reproduceable. But as we have seen, this act of translation is challenging, and takes a high degree of consensus to complete. Even when cooperation can be cemented around particular technologies, those technologies do not necessarily bring with them consistent ways of thinking. That is – and this is Law and Mol's key point - building standards also function as 'mutable mobiles', facilitating change as well as movement. This occurs when actors reinterpret standards, but also when they project new rationalities onto existing buildings. Indeed, one of the most important characteristics of buildings we have seen in this dissertation is their capacity to function as something like a 'mutable immobile'; their obduracy has often been the prompt, as opposed to the obstacle, to change.

8 John Law and Annemarie Mol, 'Situating Technoscience'. p. 616

9 John Law and Annemarie Mol. pp. 617-618

10 Michel Foucault, *The Birth of Biopolitics: Lectures at the Collège de France, 1978-1979: Lectures at the College De France, 1978-1979*, trans. Mr. Graham Burchell (New York: Palgrave Macmillan, 2010). p. 148, 157

11 Here I am paraphrasing from *Laboratory Life*: "If reality means anything, it is that which "resists" (from the Latin "res"— thing) the pressure of a force. The argument between realists and relativists is exacerbated by the absence of an adequate definition of reality. It is possible that the
following is sufficient: that which cannot be changed at will is what counts as real." See Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton University Press, 2013). p. 260

12 Here I am paraphrasing from the *Politics of Nature*: "Detached from their claim to describe domains of reality, the terms "object" and "subject" are reduced to polemical roles that make it possible to resist the supposed monstrosity of their confrontation. What is a subject, actually? That which resists naturalization. What is an object? That which resists subjectivization." See Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy*, First Edition edition (Cambridge, Mass: Harvard University Press, 2004).p. 74

13 And here again from *Politics of Nature:* "We are thus going to associate the notion of external reality with surprises and events, rather than with the simple "being-there" of the warrior tradition, the stubborn presence of matters of fact. Humans are not specially defined by freedom any more than they are defined by speech: nonhumans are not defined by necessity any more than they are defined by mute objectivity. The only thing that can be said about them is that they emerge in surprising fashion, lengthening the list of beings that must be taken into account." See Latour.p. 79

14 Latour defines the idea of a 'trial' in the essay "Irreductions", embedded within *Pasteur*. The concept is closely tied to that of 'reality', as defined above. "Whatever resists trials is real. The verb "resist" is not a privileged word. I use it to represent the whole collection of verbs and adjectives, tools and instruments, which together define the ways of being real… The real is not one thing among others but rather gradients of resistance. There is no difference between the "real" and the "unreal", the "real" and the "possible", the "real" and the "imaginary." Rather, there are all the differences experienced between those that resist for long and those that do not, those that resist courageously and those that do not, those that know how to ally or isolate themselves and those that do not." Bruno Latour, The Pasteurization of France (Harvard University Press, 1993). p. 158

15 In this paragraph I am testing some of the key concepts Latour develops in *Laboratory Life*. 'Noise' is a key terms that Latour and Woolgar suggests is a necessary circumstance for the construction of scientific 'facts': "Let us start with the concept of noise. For Brillouin, information is a relation of probability; the more a statement differs from what is expected, the more information it contains. It follows that a central question for any participant advocating a statement in the agonistic field is how many alternative statements are equally probable. If a large number can easily be thought of, the original statement will be taken as meaningless and hardly distinguishable from others." By using it here, I mean to infer analogously the importance that Noise plays in the construction of govern-mentalities, and so the importance of surprising events that stand out from it. See Latour and Woolgar, *Laboratory Life*. p. 240.

16 Cost is another important concerns for Latour and Woolgar, one which they associated with the broader concept of 'credibility'. That is, economic cost is one of the many forms of investment which pose resis-

tance to change, and as such secure agreement. "The fourth concept upon which we have drawn is that of credibility (Bourdieu, 1976). We used credibility to define the various investments made by scientists and the conversions between different aspects of the laboratory. Credibility facilitates the synthesis of economic notions (such as money, budget, and payoff) and epistemological notions (such as certitude, doubt, and proof). Moreover, it emphasises that information is costly. The cost-benefit analysis applies to the type of inscription devices to be employed, the career of scientists concerned, the decisions taken by funding agencies, as well as to the nature of the data, the form of paper, the type of journal, and to readers' possible objections. The cost itself varies according to the previous investments in terms of money, time, and energy already made. The notion of credibility permits the linking of a string of concepts, such as accreditation, credentials and credit to beliefs ("credo," "credible") and to accounts ("being accountable," "counts," and "credit accounts"). This provides the observer with an homogeneous view of fact construction and blurs arbitrary divisions between economic, epistemological, and psychological factors." By using it here, I mean to draw attention to the forms of cost and credibility that are entailed in constructing particular govern-mentalities. See Latour and Woolgar. p. 238

17 Luke Bisby, 'Professor Luke Bisby's Expert Report, Grenfell Tower Inquiry', accessed 27 June 2018, https://www.grenfelltowerinquiry.org.uk/evidence/professor-luke-bisbys-expert-report. p. 2-3.

18 Source: Reuters, 'Corbyn and May Clash over Grenfell Tower at PMQs - Video', *The Guardian*, 28 June 2017, sec. Politics, http://www.theguardian.com/politics/video/2017/jun/28/corbyn-and-may-clash-over-grenfell-tower-at-pmqs-video.

19 On June 17th, a day after protests criticizing the government's response. *The Sun* headline that day read "It Was Murder". *The Guardian* reported that event under the heading "Grenfell fury spills onto street", with sublines noting "Death toll at 30 but dozens more remain missing" and "Calls for ban on combustible cladding". *The Independent* called the event "'Justice for Grenfell' The march for answers", noting in further headlines that Jeremy Corbyn "accuses PM of failing locals" and that Sadiq Kahn "demands information on safety reviews". The *Daily Mail* led with "Three Lethal Questions"; "Were green targets to blame for fire tragedy?", "Why were families told to stay in their flats?", and "How many more tinder-box towers are there?" For *The Daily Telegraph* the headline was "Militants Hijack Inferno Protest", with a second headline noting "Corbyn-Backers Spread 'Fake News' about blaze toll". Corbyn also made a subline in *The Sunday Express* for "stirring up mob unrest", but that paper led with "Queen Calms Shaken Nation" and Teresa May's "vow to take charge". See Josh Hamilton, 'Grenfell Fire and Fallout: A Lesson In Media Framing', *The Jist* (blog), 18 June 2017, http://www.thejist.co.uk/politics/uk/grenfell-fire-fallout-media-case-study/.

20 'Homepage, Grenfell Tower Inquiry', accessed 28 May 2018, https://www.grenfelltowerinquiry.org.uk/.

21 The preparatory research for this section was developed in parallel to engaging with two forums for such discussion. The first was the Holyrood 'Building Regulations in Scotland – Ensuring People's Safety' event. The second was a cross-party group on architecture and the built environment, held at the Scottish Parliament, on September 21st 2017. I contributed to the first as an invited speaker but want here to note aspects of the discussion in the second. Taking evidence from a host of different stakeholders – engineers, architects, regulators, fire-safety experts,

manufacturers, clients – it was astonishing how quickly each sought to enrol Grenfell into sectoral advantage. For the architect presenting, for instance, Grenfell was a result of the lack of authority architects currently held; it was only by re-establishing a singular point of authority within building design, that such errors could be prevented. On the other hand, fire-safety engineers used the event to call for a further professionalisation and reinforcement of their own position as a systems analyst who has oversight of all matters of design. This meeting, in itself, offered evidence of how powerful a 'boundary object' fire is, and how many competing concerns it must seek to resolve.

22 Bisby, 'Professor Luke Bisby's Expert Report, Grenfell Tower Inquiry'. p. 2

23 Thermally 'thin' materials are those that respond to pyrolysis quickly, and so ignite easily, having either high conductivity or low heat capacity. It is conventional to use this term to describe the pyrotechnic behaviour of individual materials, but this can be misleading. As we will see below, it is possible to construe ACM cladding as relatively 'thick', in the sense that aluminium does not readily ignite. Rather, I suggest here that we can think of whole assemblies as thermally 'thick' or 'thin', and that this provides a useful way – for instance – to understand why the Grenfell refurbishment burned down, and the original tower did not. See Bisby. p. 15

24 Judith Hackitt, 'Building a Safer Future: Independent Review of Building Regulations and Fire Safety: Final Report' (Her Majesty's Stationery Office, n.d.), www.gov.uk/government/publications. p. 2

25 Torero. p. 3

26 Judith Hackitt, 'Building a Safer Future: Independent Review of Building Regulations and Fire Safety: Final Report' (Her Majesty's Stationery Office, 2018), www.gov.uk/government/publications. p. 14

27 This postscript sketches out one tension between Hackitt's report and those of the expert witnesses, but I note here another. As a third report, that of Colin Todd, notes, "High Rise does not mean High Risk". The incidence of mortality in high-rise buildings, due to fire, is *not* higher than those in other forms of accommodation. If there are greater 'risks' within this particular kind of building – centralised, tall accommodation for social tenants – they are political, rather than technical. That is, I think it is possible to say that Hackitt here follow, and legally reinforces, a popular concern about high-rise social housing, one which has been reinforced – even in 'progressive' discourse – through Grenfell. As evidence we might cite Simon Jenkins column in the Guardian, which has used Grenfell to claims that high-rise residential buildings "are antisocial, high-maintenance, disempowering, unnecessary, mostly ugly, and they can never be truly safe". Ironically, The Grenfell Enquiry reports allow us to prove that this last assertion, at least, is false. Andrew O'Hagan perhaps betrays a similar trajectory; his extensive article on Grenfell, for the London Review of Books, is titled simple 'Tower'. That is, one aspects of the fire-space of Grenfell, surely, will be an increased social and political concern about the real and perceived risks of high-rise accommodation, a concern which architects might well help to shape.
See Colin Todd, 'Report for The Grenfell Tower Inquiry: LEGISLATION, GUIDANCE AND ENFORCING AUTHORITIES RELEVANT TO FIRE SAFETY MEASURES AT GRENFELL TOWER', 2018. p. 15. Also 'The Lesson from Grenfell Is Simple: Stop Building Residential Towers | Simon Jenkins | Opinion | The Guardian', accessed 29 June 2018, https://www.

theguardian.com/commentisfree/2017/jun/15/lessons-grenfell-tower-safer-cladding-tower-blocks. Also 'Andrew O'Hagan · The Tower · LRB 7 June 2018', accessed 25 July 2018, https://www.lrb.co.uk/v40/n11/andrew-ohagan/the-tower.

28 Hackitt, 'Building a Safer Future: Independent Review of Building Regulations and Fire Safety: Final Report'. p. 3

29 Hackitt traces this principle back to the Health and Safety at Work act, of 1974: "The principle of risk being owned and managed by those who create it was enshrined in the UK health and safety law in the 1970's, following the review conducted by Lord Robens, and its effectiveness is clear and demonstrable". See Judith Hackitt, 'Building a Safer Future: Independent Review of Building Regulations and Fire Safety: Final Report' (Her Majesty's Stationery Office, 2018), p. 6. www.gov.uk/government/publications.

30 'Grenfell Tower Fire Review Branded "Betrayal and Whitewash"', accessed 27 July 2018, https://inews.co.uk/news/politics/grenfell-tower-review-branded-betrayal-and-whitewash/.

31 '"Radical Reform" of Building Regulatory System Needed, Finds Dame Judith Hackitt - GOV.UK', accessed 26 July 2018, https://www.gov.uk/government/news/radical-reform-of-building-regulatory-system-needed-finds-dame-judith-hackitt.

32 Hackitt is the former director of the Energy Saving Trust, a body which publishes a list of 'approved products' that 'meet UK regulatory requirements'. This list includes polyisocyanurate foam insulation boards similar to those used on the Grenfell tower refurbishment. For concern over Hackitt's appointment, see Robert Booth, 'Grenfell-Style Cladding Could Be Banned on Tower Blocks, Government Says', *The Guardian*, 17 May 2018, sec. UK news, http://www.theguardian.com/uk-news/2018/may/17/grenfell-style-cladding-could-be-banned-on-tower-blocks-government-says. I raise her role here myself, though, noting the real and material conflict of interest that is generated by the overlap of fire-safety and carbon-reduction aims; I do not address this directly within this postscript, but recognise that it is not one that can simply be ignored.

33 Hackitt, 'Building a Safer Future: Independent Review of Building Regulations and Fire Safety: Final Report'. p. 6

34 'Hammond: Grenfell Cladding Was Banned in UK', BBC News, accessed 4 July 2018, https://www.bbc.co.uk/news/av/uk-politics-40318318/chancellor-philip-hammond-says-grenfell-cladding-was-banned-in-uk.

35 Robert Booth, 'Grenfell Tower: 16 Council Inspections Failed to Stop Use of Flammable Cladding', *The Guardian*, 21 June 2017, sec. UK news, http://www.theguardian.com/uk-news/2017/jun/21/grenfell-tower-16-council-inspections-failed-to-stop-use-of-flammable-cladding.

36 'Grenfell Tower Fire Probe Focuses on Cladding | Construction Enquirer', accessed 27 July 2018, https://www.constructionenquirer.com/2017/06/15/grenfell-tower-fire-probe-focuses-on-cladding/.

37 Booth, 'Grenfell Tower'.

38 A third aspect of the fire-space of Grenfell, which I reflect on here in an extended note, is the importance of fire-safety for the de-regulatory agenda more broadly. This has, to date, not been politically decisive, but I

offer these notes as another example of the way that Grenfell has resisted being en-framed by particular govern-mentalities, even 'progressive' ones. Attempts to tie the Grenfell fire to the politics of de-regulation began during the first Prime Minister's Question's Time following the event, on June 28th, 2017. During that session, Jeremy Corbyn argued that the fire revealed "the terrible consequence of de-regulation", suggesting that the towers non-compliance with fire-safety standards were the result of specific de-regulatory measures, currently being undertaken, intended to reduce the cost of fire-safety inspections, and building standards approval processes, by privatising both. May's response, in what was the first PMQ of her minority government, was not to rubbish this suggestion, but to spread responsibility across the house. She pointed out that those de-regulatory measures were, in fact, started by Tony Blair: "In 2005, it was a Labour Government who introduced the Regulatory Reform (Fire Safety) Order, which transferred the requirement to inspect a building on fire safety grounds from the local fire authority, which was usually the fire brigade, to a 'responsible person'". De-regulation has been a consistent theme of successive governments since 1997, although it has gone by different names. Tony Blair, keen to define New Labour as a business-friendly party, established the Better Regulation Task Force in 1997. This independent advisory body was tasked with freeing business from the burdens of 'red tape'. It was replaced by the Better Regulation Commission in 2006, and the Better Regulation Executive in 2008, a unit within the Department for Business, Energy and Industrial Strategy that continues to "lead the regulatory reform agenda across government". This unit has been influential in introducing the concept of 'Regulatory Budgets', an initiative which sought to restrict the amount of new regulations that governmental departments could propose, and to make de-regulation of existing standards a necessary corollary. The 2010-2015 coalition government put its particular stamp on this agenda through two initiatives. David Cameron's 'Red Tape Challenge' sought to enrol public engagement in the process of de-regulation, publishing lists of standards, and asking businesses to comment as to whether they should be scrapped. By 2015 he was pleased to announce that "[w]e have trawled through thousands of pieces of regulation – from the serious to the ridiculous, and we will be scrapping or amending over 3,000 regulations – saving business well over £850 million every single year… This government has already stopped needless health and safety inspections. And we will scrap over-zealous rules which dictate how to use a ladder at work or what no-smoking signs must look like… [we will also] Help house builders by cutting down 100 overlapping and confusing standards applied to new homes to less than 10. These reforms are estimated to save around £60 million per year for home builders – equivalent to around £500 for every new home built." The coalition government also developed the notion of Regulatory Budgets through its 'One-in, One-out' rule. This new rule required that any new regulation that imposed a net cost on business be balanced by a compensatory reduction in regulatory cost elsewhere. In 2012 the conservative government 'doubled-down' on this initiative with One in Two Out, a regulation which, in 2016, was likewise replaced by One In, Three Out (of which Donal Trump is said to be a big fan). This ongoing de-regulatory drive has promised to deliver a £10 billion saving to businesses on the cost of regulatory compliance. While the economic benefits of these policies are disputed, by the National Audit Office among others, their discursive effect appears clear; they have established a new performance indicator for legislative action, and defined cost-saving for business as the meta-purpose of government. The political economy of regulatory budget keeping is worth reflecting on briefly, as it provides an important context for the regulatory reform initiatives that both Corbyn and May connected with the Grenfell fire. A first point of consideration would be the requirement - counterproductive as it appears - that only

'first-order' economic benefits be considered within regulatory budgets. That is, if mandatory smoke alarms in new houses are expected to reduce the number of fires in houses, and so the reduce the cost of insurance claims, lost productivity, costs to public services, and so taxation, these 'second-order' costs cannot be included in budgetary calculations; the only relevant cost is that implied for the contractor of satisfying the legal requirement. As such, current policies for regulatory budgeting are, by design, unable to account for any economic benefit of any governmental action, which they conceive of as pure loss. Consequently, legislative action today hinges not on demonstrating the economic benefit of governance itself, but simply on reducing its cost. And this is achieved, supposedly, by employing civil servants to finding old rules that they can abolish, uncontrovertially. We see the consequence of this govern-mentality, reading through the regular 'Statements of New Regulation' provided as part of this budgetary measure. 79 war-time laws – such as the *Trading with the Enemy (Enemy Territory Cessation) (Guam) Order 1975)* - are scrapped, and this legislative action construed as a cost saving, through which to account for new proposed measures. This equation is intentionally blind as to whether extant but out-dated rules actually carry any costs, as to whether the approved rules carry net losses or costs, and of course it ignores the actual cost of cost-accounting. I offer this context because the 2005 *Regulatory Reform (Fire Safety) Order* was perhaps the most significant and concrete achievements of the Regulatory Reform agenda to date. As demonstrated by hearings at the House of Common Regulatory Reform Committee, this single statute could, according to expert testimony, be used as evidence to support the reform agenda as a whole, and the tangible costs savings that it was delivering: "we put through the changes to the fire regime and it was probably the biggest change and the biggest deregulatory reform that we put through this committee. It was not the most controversial… The fire safety regime in 2007, in the summary of the Department of Simplification Plan, claimed £53million in saving from scrapping the fire certificate regime as a result of the changes... [I]nstead of sending out fire officers to investigate premises and the business having to pay for those investigations, nowadays it is more of a self-certification and there has been a big reduction in the number of visits required to premises, so that must somewhere register as a saving, certainly to larger businesses." The precise role of inspections, or their lack of, within the Grenfell Tower fire, and so any consequence it may have for the Regulatory Reform (Fire Safety) Order, are yet to be determined, but in terms of media response, this particular attempt to politicise the event did not generate the momentum it might have. The London Fire Brigade quickly confirmed that, while they had visited the building, they did not 'sign off' such refurbishment projects. Likewise, it transpired that multiple site inspections had been made – by the Royal Borough of Kensington and Chelsea – but that these had failed to uncover fire-safety problems. That is, what seems to me of interest here are the reasons why this issue has yet to be successfully politicised. Corbyn's attempt to connect Grenfell to the broader question of de-regulation stumbled over particularities of this fire, and this building. The value of fire-safety inspections on this project were ambiguous; this fire provides no evidence for, or against, their de-regulation. That is because the client – a local authority – conducted those inspections, despite their not being legally mandatory, still failing to identify a fire-risk. Had the fire occurred in a private sector building, and those inspections not occurred, the political consequences might have been incendiary in quite different ways. That is, I want to suggest that the 'fire-space' of Grenfell has created very particular kinds of 'reality tests'. That this tower was local authority owned immediately pointed a finger at regulators, at local councils, and at tenant management authorities as the points of responsibility. But the fact that these points of responsibility continue to exist in this case is unusual, even anachronistic. The broader

purpose of de-regulation is precisely that responsibility for standards, for social housing, and for building design and inspection, be outsourced to the private sector. Attempts to resuscitate, via Grenfell, an image of the social housing as a programme of national solidarity have had limited purchase, because that building is the rear-guard of a policy position that has long since been evacuated.

39 'London Fire Brigade Denies It Signed off Grenfell Tower Refurbishment', The Independent, 16 August 2017, http://www.independent.co.uk/news/uk/home-news/grenfell-tower-later-london-fire-brigade-denies-signed-off-refurbishment-work-a7897466.html.

40 Department of Communities and Local Government, *Approved Document B: Fire Safety, Volume 1 Dwellinghouses*, 2013 edition (Place of publication not identified: National Building Specification, 2013).

41 '"Flaw in Industry's Thinking on Panels"', Inside Housing, accessed 4 July 2018, https://www.insidehousing.co.uk/news/news/flaw-in-industrys-thinking-on-panels--51019.

42 In the review of regulatory failings I am providing here, I draw heavily on existing and excellent media coverage. Outstanding among this was the coverage offered by *Inside Housing*. It is in their coverage that the DCLG memo quoted from here was unearthed. See Inside Housing, 'The Paper Trail: The Failure of Building Regulations', Shorthand, accessed 4 July 2018, https://social.shorthand.com/insidehousing/3CWytp9tQj/the-paper-trail-the-failure-of-building-regulations.

43 Here I am quoting from evidence given by Tony Enright, a fire safety engineer, cited by *Inside Housing* in their analysis of the Grenfell Tower 'paper Trail'. See Inside Housing.

44 'Expert Panel Recommends Further Tests on Cladding and Insulation', GOV.UK, accessed 4 June 2018, https://www.gov.uk/government/news/expert-panel-recommends-further-tests-on-cladding-and-insulation.

45 'Statement Regarding Celotex BS8414 Cladding Tests', *BRE Group* (blog), 31 January 2018, https://bregroup.com/press-releases/celotex-statement/.

46 'Scale of Fire Safety Testing Failures Laid Bare ABI', accessed 4 June 2018, https://www.abi.org.uk/news/news-articles/2018/04/scale-of-fire-safety-testing-failures-laid-bare/.

47 Robert Booth, 'Cladding Tests after Grenfell Tower Fire "Utterly Inadequate"', *The Guardian*, 24 April 2018, sec. UK news, http://www.theguardian.com/uk-news/2018/apr/25/cladding-tests-after-grenfell-tower-fire-inadequate-claims-insures-report.

48 'James Brokenshire Publishes Consultation on Banning Combustible Cladding', GOV.UK, accessed 6 July 2018, https://www.gov.uk/government/news/james-brokenshire-publishes-consultation-on-banning-combustible-cladding.

49 'Grenfell Tower Fire: Dangerous to Politicise London Tragedy - EXPRESS COMMENT | Express Comment | Comment | Express.Co.Uk', accessed 27 July 2018, https://www.express.co.uk/comment/expresscomment/818129/Grenfell-tower-fire-london-politicised-protest-demands-answers.

Standard Side Effects
On the accidental architecture of fire-safety legislation

Dissertation

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